ECRETS OF THE LOMCEVAK REVEALED

MODEL AIRPLANE NEWS

48120 May 1993

THE WORLD'S PREMIER R/C MODELING MAGAZINE

FREE

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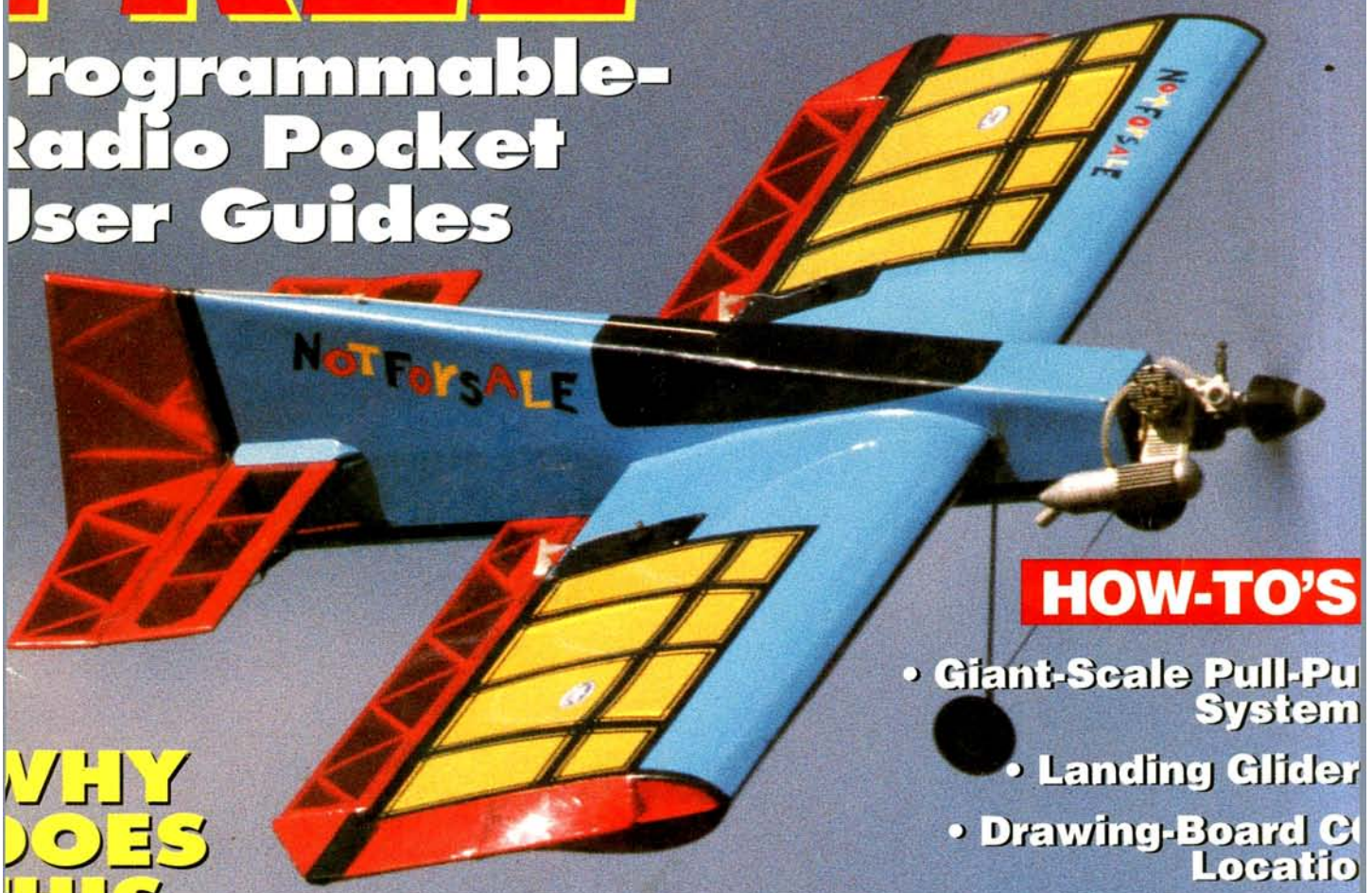

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MAY 1993 VOLUME 121, NUMBER 5

MODEL AIRPLANE NEWS

FEATURES

ABOVE: *full-size Curtiss Jenny takes off at the 26th Annual R/C Jamboree at the Old Rhinebeck Aerodrome. (Photo by Frank Gudaitis.)*

ON THE COVER: *Blaine Stetler's original Notforsale fun-fly ship is captured in the air by photographer Brad Varney (see construction article).*

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

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EDITORIAL

TOM ATWOOD

DUTY CALLS

AS I NOTED in my Editorial in the April '93 issue, it is important that each of us write to the FCC, and to our representatives and senators, to protest the proposed rule (NPRM—PR Docket 92-235) that, if implemented, threatens to render unusable two-thirds of our airborne R/C frequencies. Letters from a large number of R/C modelers are needed to get the job done. We at Air Age have written our letters. Have you?

There appears to be a failure on the part of the authors of the proposal to appreciate the scope and extent of participation in the sport of R/C in this country. If we allow this to happen, what encroachment will be next?

In the last issue, we reprinted an urgent notice and a draft letter prepared by the AMA. Below are some additional arguments you may wish to consider in composing your own letter, if you haven't already written. Mention NPRM—PR Docket 92-235. Send your letters to: FCC, 1919 M St. NW, Washington, D.C. 20554; your senator, U.S. Senate, Washington, D.C. 20510; and your representative, U.S. House of Representatives, Washington, D.C. 20515. For the name of your senator or representative, contact the Capitol switchboard at (202) 224-3121. Some points worth considering:

• R/C modeling is a clean, wholesome activity that inspires kids and generates sportsmanship, disciplined thinking and a sense of responsibility. If the radio environment becomes more restricted, so will the opportunities for involvement by youngsters.

• Most of our astronauts and aerospace engineers were modelers. Many, if not most, were profoundly influenced by their modeling involvement and will quickly point this out. Are we going to deprive today's younger generation of the technologically current expression of our aviation heritage, thereby discouraging them from following in the footsteps of these leaders?

• The aviation tradition in this country is a grand, American phenomenon with broad historical sweep, and R/C modeling is on its leading edge. Do we wish to curtail the ability of hundreds of thousands of our citizens to participate in aviation on an affordable, yet high-tech level?

• Reducing access to radio frequencies will kill a remarkable technological flowering. Further development of R/C sports

DON'T LET THIS HAPPEN

is at risk. What opportunities for technically challenging indoor and outdoor recreation are we going to lose as a society? Do we want to limit our citizens to watching TV?

• A large number of small and medium businesses make ends meet by supplying or supporting R/C manufacturers or R/C enthusiasts. Many hobby businesses—and the livelihoods of thousands who work for them—would be jeopardized if the R/C segment were strangled. And what about the indirect beneficiaries who are recipients of R/C enthusiast dollars (e.g., gas, motels, film, etc.)? All of this business is threatened by the proposed rule. Why do this if alternative approaches are available?

RADIO POCKET REFERENCE GUIDES

In this issue, Dave Baron's "Simple Programming" column offers an added bonus: two programmable-radio pocket reference guides for the Futaba 7UAPS and JR X-347 radios. The guides are designed to fit in your pocket, wallet, or field box. The guides are surprisingly helpful in steering you through the radio's programming system to the menu or function you need. In our June issue, we will include guides relating to Airtronics and Ace radios. If you want to see more of these, write and let us know!

'93 UNLIMITED AND AT-6 RACES

Here's the latest. The next Madera Unlimited and AT-6 races will be held on October 6 to 10 in Madera, CA. For more information, contact The Unlimited, P.O. Box X, Torrance, CA 90507, or call (310) 320-8369. Another pair of Unlimited and AT-6 races—sponsored by Hobby Barn—will be held in Tucson, AZ, on April 22 to 25. The Tucson Unlimited Race will have no qualifying races: trophy-race slots will be determined by heat-race elimination, which will allow the sponsors to increase the number of heat races. For more information, contact Hobby Barn at (602) 747-3633 and ask for Bobby Wilson or Bill Hempel, Sr. GSARA rules apply to both the Tucson and Madera races.

Another giant-scale AT-6 race, titled the "Houston R/C Air Races," will be held in Houston, TX, on June 24 to 27 by the Bayou City Flyers. For more information, contact Wiley Brown at (713) 469-6460. There will also be an AT-6 race at the August 11 to 15 1993 Aviation Expo in Ankeny, IA. For more information, contact Joe Schumacher at (712) 364-3167.

The Reno Unlimited Model Air Racing Association (RUMARA) has notified us that an Unlimited/AT-6 race will be held at the Stead Airfield, outside Reno, NV, on June 2 to 6, 1993. RUMARA is a nonprofit corporation dedicated to the promotion of racing and model aviation. The RUMARA rules vary somewhat from the rules promulgated by GSARA. Models must be 22.5 percent scale or larger, and there will be a scale judging portion of the competition. For further information, contact RUMARA at 6801 Flower St., Reno, NV 89506-1712; (702) 677-0869.

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AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

BALANCING PROPS

I believe you made a mistake when answering the letter on prop balancing from Chris Filtz in the March '93 issue. You said to remove material from the back of the prop blade. I don't agree. Since the back of the prop is doing all the work (pushing air/pulling the airframe), it should not be sanded off. This would change the pitch on that blade.

The proper way to balance a prop is to sand the front face or add a thin layer of CA to the front face toward the tip of the lighter blade. This CA trick works on wood, nylon or plastic props.

DAN STOLARCZYK
White Lake, MI

Dan, a two-blade prop blade is actually a pair of small wings. Prop blades have all the characteristics of a wing's airfoil (see Propeller Selection, Pt. 1, by Andy Lennon, in the November '92 issue of Model Airplane News). So it is not just the rear surface of a prop blade that is doing the work. But your letter raises an interesting question. We asked Carl Risteen, an aeronautical and mechanical engineer with extensive experience in RPV and propeller design: does it make a practical difference which side is sanded when balancing a prop? (Carl authored the articles on Flutter in our March and April '93 issues, and articles titled "Fine Tuning Propellers" and "Propeller Efficiency" in our March and September '86 issues).

When Carl balances a prop, he typically scrapes a few thousandths of an inch off the rear side of a propeller blade, toward the tip. Carl notes that the rear surface of a prop blade is usually flat. With the help of a large X-Acto blade, it is easy to remove a small amount of material while maintaining the flat surface on the back of the blade. Scraping the back of a blade in this fashion does not, for practical purposes, change the propeller pitch. If scraping a wood blade removes the finish and exposes raw wood, Carl recommends that you apply one or two coats of urethane varnish to reseal the blade (coat the entire prop to maintain balance). Exposed, raw wood will pick up moisture and oil, and this can change the prop's balance. If a second or third coat of varnish is applied to the entire prop, both sides of the blades should be sanded with 400-grit sandpaper to achieve a good slippery finish. Follow this with 600-grit paper and rubbing compound to achieve a mirror finish. Such a finish may help in reducing drag, and it looks nice.

Summing up, it usually doesn't matter whether you scrape the front or rear surface (or both) of a prop's airfoil a couple of thousandths of an inch. Careful removal of such a small amount of material will usually not alter the airfoil enough to make a practical difference in prop efficiency. To be on the safe side, scraping the flat, rear surface is recommended.

TA

ENGINE PARTS; FOAM CUTTERS

I need a piston and ring for an HB PDP .40. Do you know anyone who sells HB parts? I'm also looking for an article on a home-built foam cutter. Did you print such an article? If so, in which issue? I stripped the glow-plug threads in an OS .90. I remember seeing an ad in an R/C mag for a brass insert, but have been unable to find the ad. Do you have any suggestions? Thank you.

DALE ADAMS
Osage, Iowa

Dale, HB engines and parts are readily available from: RJL Industries USA, P.O. Box 5, Sierra Madre, CA 91025; (818) 359-0016.

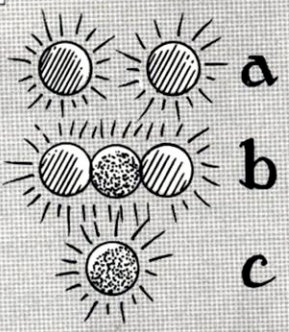
In the July '91 issue of Model Airplane News, we ran an article called "Building Secrets" that included a piece on building a foam scroll cutter. Although you did not specify, I'm sure that you're referring to a foam-wing cutting tool. Aircraft Spruce & Specialty Co., Inc. (P.O. Box 424, Fullerton, CA 92632) offers a Homebuilder Hot-wire Kit which I understand costs about $25.00, including the stainless-steel safety wire. Also, Tekoa's Feather/Cut Hot Wire Foam Wing Machine cuts straight or tapered wings, fins and stabs, hands-off. We will be running a review of this automatic cutting tool soon, so watch for it. For more information on the Feather/Cut contact:

(Continued on page 123)

HINTS & KINKS

JIM NEWMAN

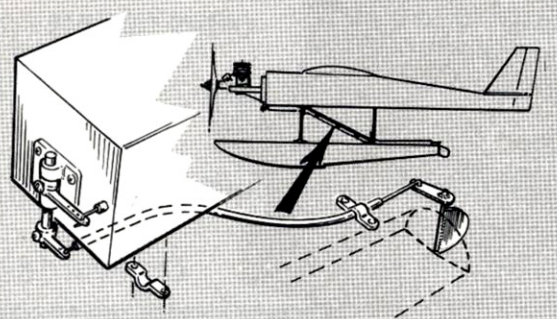
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o *Model Airplane News*, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive,we can't acknowledge each one, nor can we return unused material.



WHAT'S CHARGING?

Some people have difficulty distinguishing the greenish-orange light showing on the single LED of the Futaba charger. Try this. Shake your head rapidly from side to side while staring at the charger's LED. If only the receiver is charging, you'll see two green lights as in (a). If the transmitter and receiver are charging, you'll see two green lights with a red one in between (b). If only the transmitter is charging, you won't need to shake your head because you'll see only a single red LED as in (c).

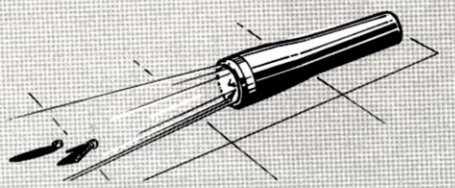
Dennis McCracken, Burgettstown, PA



STEERABLE WATER RUDDER

Install a steerable nose-gear bearing as usual, but instead of a nose leg, fit a short shaft and a second steering arm just below the fuselage bottom. Now you can run a thin cable and a pushrod system from the lower arm along the fuselage bottom, down the diagonal strut and along the top of the float. One rudder is usually sufficient, and those nylon landing-gear clips can be used to secure the cable housing where required.

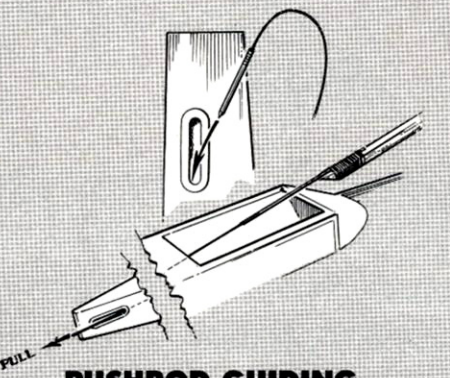
Bob Handley, Goodyear, AZ



LOST PARTS FINDER

When small parts fall to the floor, they can be difficult to see. Shine a small, powerful flashlight around the floor; those parts will cast long shadows, and you'll be able to find them quickly.

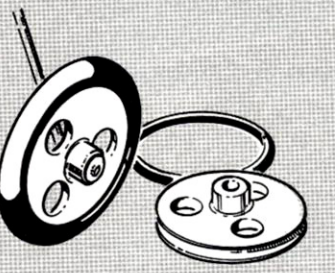
Tore Hansen, Drammen, Norway



PUSHROD GUIDING

Cut the head from a 3-inch nail, then use a spot of thick CA to attach a thread to the end. Lower the nail through the pushrod exit at the rear of the fuselage, and when it appears in the radio compartment, remove the nail and attach the thread to the pushrod using CA. Now you can use the thread to guide the pushrod through the fuselage and out through the exit.

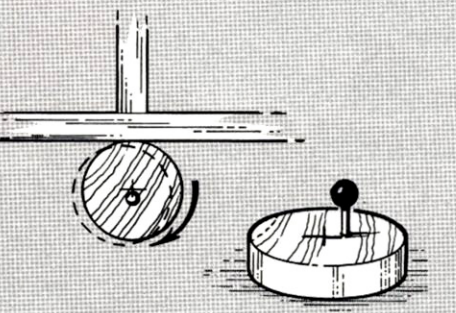
Gilson Brizolino Ramos, São Paulo, Brazil



LIGHTWEIGHT WHEELS

Old tape recorders, VCRs or record players will often yield lightweight molded drive wheels like those shown here. Substituting a larger section rubber O-ring (from the hardware store) will create a nice-looking wheel that's suitable for those "Small Steps"-type models. A drop of thin CA might be necessary to keep larger O-rings in place.

Saeed Rahini, Shiraz, Iran

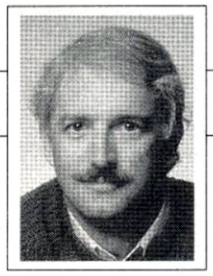


BUILDER'S CAM CLAMPS

Cut sections of a large dowel or broom handle, and drill a small hole in each, slightly off center. As each spacer is glued in place, rotate the cam 90 degrees to apply slight pressure against the longeron while the glue dries. It's great for those who still favor conventional Elmer's glue over CA.

George Herrick, Henry, IL

AEROBATICS MADE EASY



DAVE PATRICK

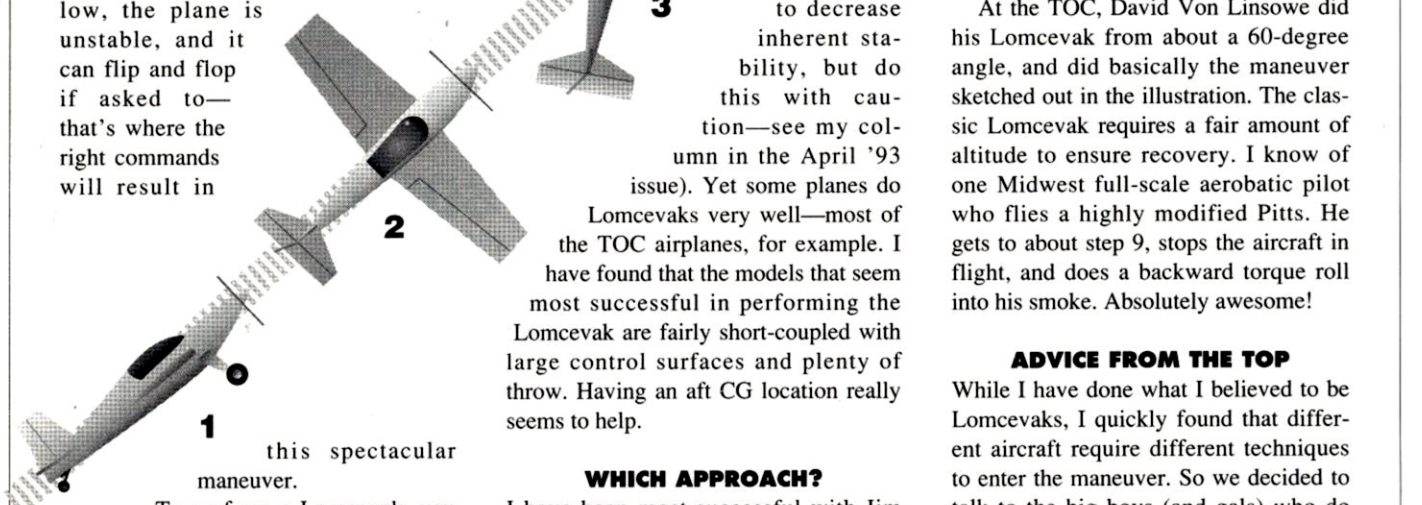
THE LOMCEVAK

THIS MONTH, with the help of good friend Don Aliffi, producer of the "Wring It Out" series of tapes, we're going to focus our attention on a particularly interesting maneuver: the Lomcevak. You're going to learn nearly everything you'll ever want to know about this elusive and intriguing maneuver. But before we start, I'd like to thank Don for doing all the legwork that made this month's column a possibility.

LOMCEVAK DEFINED

A Lomcevak is described by some as a "cross outside snap." Others call it a tumble in which the tail rotates forward—through the direction of flight—until it is momentarily "in front of" the engine. Still others say it is not a strict requirement that the tail rotate in front of the engine. The illustration depicts what I consider to be the "classic" Lomcevak. In this example, the tail clearly gets ahead of the engine, in the direction of flight.

Note that the tumble (and there can be more than one in a Lomcevak!) is done at the apogee of the maneuver. At the top, air speed is low, the plane is unstable, and it can flip and flop if asked to—that's where the right commands will result in this spectacular maneuver.



To perform a Lomcevak, you must have the right combination of control throws, CG placement, power, entry speed and coordinated, well-timed manipulation of the controls. You won't be able to perform a good Lomcevak if the tail on your plane is too large, if the plane is nose heavy, or if the control throws are lacking. If you have too high of an entry speed, the furthest the tail will go forward into the line of flight is shown by the position of the plane in step 7. From there, the plane would go into a simple outside spin (no Lomcevak).

You must also have the right airplane to perform this maneuver. Most models have so much inherent stability that they are reluctant to go into Lomcevaks (moving the CG rearward is an easy way to decrease inherent stability, but do this with caution—see my column in the April '93 issue). Yet some planes do Lomcevaks very well—most of the TOC airplanes, for example. I have found that the models that seem most successful in performing the Lomcevak are fairly short-coupled with large control surfaces and plenty of throw. Having an aft CG location really seems to help.

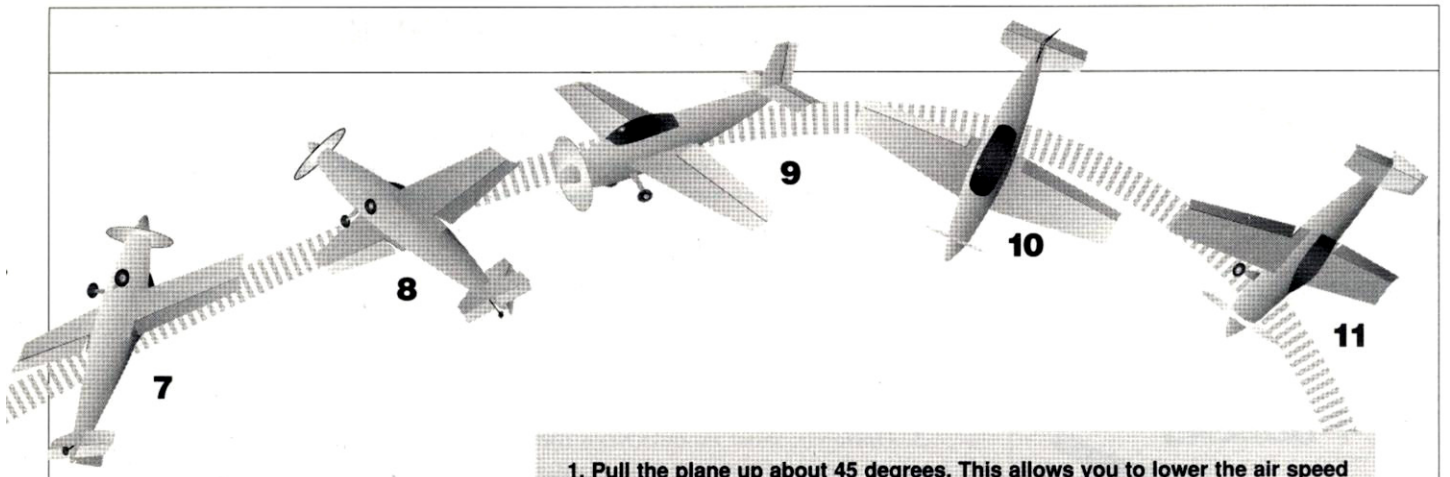
WHICH APPROACH?

I have been most successful with Jim Stanton's first technique (explained below), which can utilize the optional, same-direction aileron throw, and also with his second technique, which uses the ¾ snap to enter. My technique for the TOC—a maneuver some describe as the "CAP Lomcevak"—was to enter at low altitude, put the smoke on, pull up about 20 degrees, and simply push full down-elevator, full left rudder and full left aileron. My plane would do a quick two-tumble Lomcevak, but it would not complete the tumble—it would get close to the attitude shown in step 8, twice, and then recover at about the same altitude, losing most of the air speed. The tail never rotated directly through the line of flight, but was strongly canted to the side through the tumbles.

At the TOC, David Von Linsowe did his Lomcevak from about a 60-degree angle, and did basically the maneuver sketched out in the illustration. The classic Lomcevak requires a fair amount of altitude to ensure recovery. I know of one Midwest full-scale aerobatic pilot who flies a highly modified Pitts. He gets to about step 9, stops the aircraft in flight, and does a backward torque roll into his smoke. Absolutely awesome!

ADVICE FROM THE TOP

While I have done what I believed to be Lomcevaks, I quickly found that different aircraft require different techniques to enter the maneuver. So we decided to talk to the big boys (and gals) who do this maneuver routinely in their full-size Pitts, Extras, Ultimates and Sukhoi's.



1. Pull the plane up about 45 degrees. This allows you to lower the air speed while maintaining full power. You have to have a lot of power to get through the maneuver.

2. Roll right to knife edge. We roll right because, in a moment, we will snap left, utilizing the torque of the engine to add speed to the snap. This torque counts for a lot as you near the apogee of the maneuver, where control surfaces have diminished effect.

3. Now it's time to snap. From the knife edge, apply full left rudder, full left aileron and full up-elevator. This initiates the gyroscopic motion of the plane and positions the tail at the maximum limit of its pitch angle in this stall maneuver. The aircraft is now snapping to the left.

4. The plane is now "deep" into the snap.

5. The leftward rotation of the snap roll continues (counterclockwise from the pilot's view). The speed of the rotation is picking up, and the tail is still at its maximum pitch angle. The plane is also near the apogee, and most of the forward speed has diminished.

6. At about this inverted attitude, a key control input is given—full down-elevator. In a sense, you have a loaded spring, because the elevator has been at full up, and the tail is poised to rapidly gain momentum in the pitch axis as soon as you reverse to full down-elevator. When that control input is made, the nose of the inverted airplane will spring skyward as you maintain full left aileron, full left rudder and full power. The resulting movement from position 6 to position 7 is rapid. This is the magic part of the classic Lomcevak.

7. Now the tail rotates forward—under the plane—in the direction of travel. While the tail sweeps underneath to the front, the plane also continues its leftward roll. Again, all of this is happening near the apogee, so the air speed is low. But power remains high, and the prop wash blowing over the tail is enough to move it forward.

8. The plane essentially hovers, and the tail moves ahead of the airplane.

9. If you are lucky and good enough to get to step 9, you will get to step 10.

10. The airplane has lost its momentum—has nearly stopped its forward movement—and starts to fall.

11. If you maintain the controls, you will find yourself in an outside spin. Expect this, as most aircraft will do this, whatever you do with the controls.

We learned that there are as many techniques as there are full-size pilots to ask—each seems to have his or her own special way of performing the Lomcevak, not to mention how to spell or even pronounce it!

There are endless amounts of gyroscopic maneuvers that have evolved from Lomcevaks. Are they all Lomcevaks? Clint McHenry, many-time U.S. national champion in full-size aerobatics, and past world champion, flies full-scale SU-26 and SU-29 Sukhois. He is a Pompano Beach aerobatic instructor. (Incidentally, if you want to experience a full-scale Lomcevak, you can purchase such a flight at the Pompano Aerobatic Center, just north of Ft. Lauderdale, FL. Bring your Visa card!) Clint commented that there are quite a few different kinds of Lomcevaks. The attitude and flight path of the airplane make a difference both in what the airplane does and how it looks.

In Clint's view, the classic Lomcevaks were the ones done by the Czechoslovakians back in the early '60s. They were entered from a 45-degree, upward angle from a knife-edge attitude, with full forward stick, full aileron and full rudder in the same direction. But Clint quickly points out that to do it correctly, you have to get a feel for the control input. You don't want to enter it too fast.

Clint advises that when you get a feel for the right air speed and the right entry, you can do Lomcevaks over and over again, and for that matter, from level, descending, ascending, or vertical (up or down) flight. They all look different and you might not recognize them as Lomcevaks, yet the control input is the same. The outcome differs because of the energy and the flight path involved in a given entry.

Although many say it's not a Lomcevak if not entered from a 45-degree angle, Clint disagrees. In his opinion, a knife-edge spin is a form of Lomcevak, it just happens to be vertically down!

MORE TECHNIQUES

Below, I have summed up the advice of other experts who were kind enough to share their thoughts on the best way to enter a Lomcevak.

Tim Nealy is a famous Midwest air-

AEROBATICS MADE EASY

There seems to be some controversy over what Lomcevak means. Some say it means headache, some say hangover and some say "hurt all over." I have even been told it means "break a leg."

show pilot who flies an Extra 300. Tim, who also is an accomplished R/C pilot, recommends the following:

1. Pull up to about 60 degrees.
2. Roll left 90 degrees (to knife edge).
3. Optional: most models have too much power so you may need to throttle back to about 50 percent.
4. All at once, add full right rudder, full down and full left aileron.
5. Hang on!
6. After completing the maneuver, the plane will enter an inverted spin. Recover by neutralizing the controls.

Jim Stanton is an aerobatic instructor at the Pompano Air Center, which also has the world export rights to the famous Sukoi 26 and 29.

1. Pull up to about 60 degrees.
2. Roll left 90 degrees.
3. All at once, add full right rudder, full down and full left aileron.
4. Optional: instead of full left aileron, try right aileron. This sometimes makes for a cleaner tumble.
5. Hang on!
6. After the Lomcevak, the plane will enter an inverted spin. Recover by neutralizing the controls.

Jim goes on to explain that some of the best Lomcevaks that he has performed were done as follows:

1. Pull up to about 45 degrees.
2. From upright, perform a 3/4 left inside snap.
3. As the aircraft reaches the 3/4 snap position, apply full down and right rudder, keeping full left aileron.
4. After completion, the plane will enter an outside spin. Recover by neutralizing the controls.

John Conrad is a well-known aerobatic pilot and advisor to the U.S. Aerobatic team. John's explanation is very similar to Tim Nealy's. The only difference is that when it's time to do step 3, there's a slight delay before inputting the right rudder.

Joann Osterud, the famous West Coast air-show pilot, holds several world records flying the original Ultimate. Joann advises that the Lomcevak can be entered from a variety of positions. For example, from inverted:

1. Pull up to 80 degrees, then roll inverted.
2. Simultaneously apply full down, left aileron and right rudder.
3. Hang on!
4. Recover, as before, from an inverted spin.

From knife edge:

1. Pull to about 45 degrees or more.
2. Roll left 90 degrees to knife edge.
3. "Tap" a bit of left rudder.
4. Then immediately put in full right rudder, full down elevator, and left aileron.
5. Hang on!
6. Recover from an inverted spin.

Wayne Handley is a famous West Coast air-show pilot, inventor of "agrabatics" and a recognized authority on gyroscopic maneuvers. He is currently flying his new sensation, the Raven. Wayne seems to do every variation listed so far, plus a couple! One interesting point: in some of his descriptions on how to do Lomcevaks, he doesn't use aileron (or he uses very little), but he does in the following variant, which seems so simple!

1. Gently pull up to about 30 to 45 degrees.
2. Simply input full right rudder, down and left aileron.
3. Hang on!
4. Recover from an inverted spin.

TUMBLE TIME

Well, I hope this helps you in developing techniques that get your model tumbling all over the sky. I really love doing them. As you become more proficient and braver, you can do them low and maybe add smoke to really impress your friends.

In closing, there seems to be some controversy over what Lomcevak means. Some say it means headache, some say hangover and some say "hurt all over." I have even been told it means "break a leg." Can anyone help? 'Til next month! ■

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

Detective Zingpot

Hobby Lobby's new Z.I.N.G.P.O.T. (part no. HLHS005) is a heat-sensitive tape (accurate to within ½ degree) that changes color as your batteries warm up during the charging process. If one cell is hotter than the others, it will show up as a different color than the rest of the pack, and—AH HAH! The culprit is exposed! This stuff comes in a pack of four for $9.90 and lasts indefinitely. By the way, Z.I.N.G.P.O.T. stands for "Zellen Ist No Guten Pointer Outen Tapen." Yeah, sure, good name guys. Personally, I'd have called the stuff Sherlock Holmes Tape. Anyway, I hear that this product really does what it's supposed to do, and it will certainly help you to keep track of the condition of your packs. For more info, contact Hobby Lobby Int'l Inc., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444

High-Fiber Content

Is this one easy step for beginning modelers and one great leap for high-tech modeling enthusiasts? California Carbon's sheets of iron-on composite fiber are impregnated with a lightweight thermoplastic web. Strips of this unidirectional carbon fabric can be tacked to spars or other structures using a low-temperature iron. Once tacked, a light coat of thin CA penetrates the fabric and bonds its fibers to the underlying structure. This iron-on material is offered in several sizes: 12x12-inch sheets for $5.50, 2x48-inch sheets for $9 and 12x48-inch sheets for $18. (Please include $1 for shipping and handling.) Kevlar and S-Glass iron-on materials are also available. For more information, contact California Carbon, P.O. Box 39, Jamul, CA 91935; (619) 579-5418.

Start-R-Stik

Finally!—an industrial-strength chicken stick that will safely start your engine *and* look good in your field box. The Start-R-Stik—another sensible product from the Davis Diesel think-tank—comes in two sizes: one for props of up to 14 inches in diameter ($5.95) and another for props with diameters of 16 inches and larger ($6.95). If you want to get a grip on safety, contact Davis Diesel Model Products, Box 141, Milford, CT 06460; (203) 877-1670.

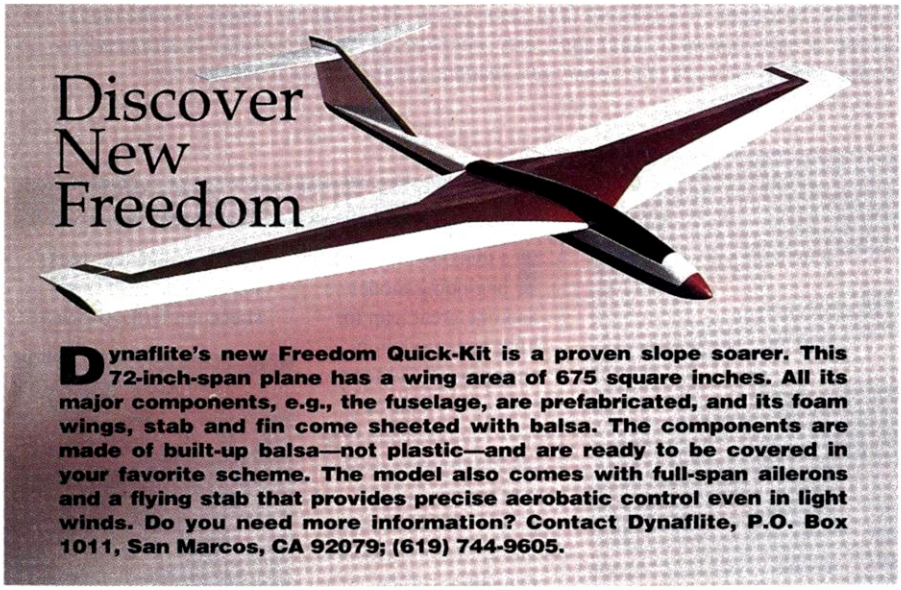
(Ten inch prop shown)

F-18 Hornet Pusher

Introduced at the Northwestern R/C Model Expo in Puyallup, WA, this new "pusher" jet has a polyester/glass fuselage and foam-core wings, and it uses a .61 2-stroke engine. All the radio gear is mounted on a plywood plate under a removable nose cone, and this helps to balance the engine's weight in the tail. This 68-inch-long model comes with factory-installed plywood retract plates, and it has a 54-inch wingspan and a 900-square-inch wing area (its wing loading is 22 ounces per square foot). The price?—$289.95. This model was seen on video as it lifted effortlessly off grass fields. For more information, contact G&P Sales, 410 College Ave., Angwin, CA 94508; (707) 965-3866.

AIR SCOOP

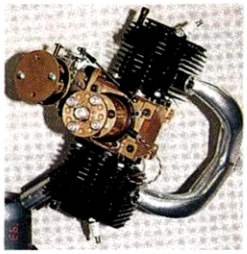
Discover New Freedom



Dynaflite's new Freedom Quick-Kit is a proven slope soarer. This 72-inch-span plane has a wing area of 675 square inches. All its major components, e.g., the fuselage, are prefabricated, and its foam wings, stab and fin come sheeted with balsa. The components are made of built-up balsa—not plastic—and are ready to be covered in your favorite scheme. The model also comes with full-span ailerons and a flying stab that provides precise aerobatic control even in light winds. Do you need more information? Contact Dynaflite, P.O. Box 1011, San Marcos, CA 92079; (619) 744-9605.

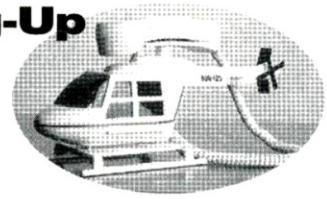
Gold Aerrow

Aerrow's new Unlimited Racing engine—the A200RS Gold Aerrow—is a racing version of the reliable, powerful A200S. It's being produced in limited quantities for serious competitors, and it features: special porting for more power at high rpm; reduced weight; a heavy-duty crankshaft with matched pistons; an impressive black-and-gold exterior; and a lighter, matched, tuned, exhaust system made of aluminum. If you want more information, write to Aerrow Inc., Dept. R, P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada K7H-3E3, or call Klaus Nowak at (613) 264-0010; fax (613) 264-8441.

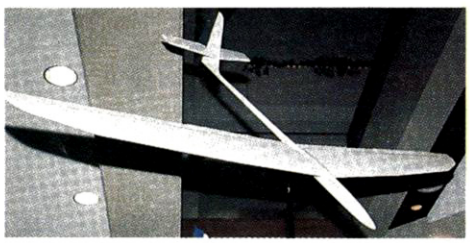


Rotary Ring-Up

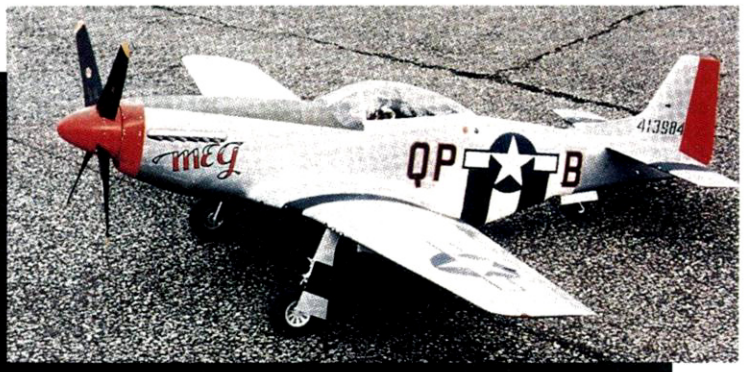
Is this the hot line directly to the rotary-wing wizard in the sky? Not really, but it certainly has great potential as a conversation piece in your workshop. The flashing cockpit light and the ringer signal incoming calls, and it also features touch-tone dialing. Contact Medved's, 5233 Six Mile Rd., Racine, WI 53402; (414) 681-2469.



Molded Miracle?



Ever hear the whistle of an F3B sailplane as it dives toward the ground at 150mph? It's an awesome sound—one you can experience with Greco Technologies' new ready-to-fly Molded Modi 900. This ultra-high-tech, 85-ounce plane has hollow-core wings made of a fiberglass/Rohacell/fiberglass laminate. An interior carbon-fiber/Rohacell spar (vacu-bagged twice during construction) is wrapped with Kevlar and "shear-webbed" with fiberglass. The 112-inch-span plane has an area of 911 square inches, a fiberglass, Kevlar and epoxy fuselage, all-metal pushrods and a price tag of $900. For more information, contact Greco Technologies, Pasadena Financial Center, 35 North Lake Ave., 7th Floor, Pasadena, CA 91101; (818) 405-2999; fax (818) 405-2984.



Semi-Kit from Holman

According to Bob Holman, this is the nicest .90 P-51D available. The plans are by Brian Taylor, who has flown on the top British scale team many times and is one of the world's best scale designers. The 69-inch-span model calls for a 4⅜-inch spinner, and it has an exact-scale landing-gear location. The semi-kit includes a fiberglass cowl and scoop, a canopy, drop-tanks, wing ribs and an epoxy/glass fuselage. The kit costs $220 (plus $20 shipping), and you have the option of buying only the accessories. For more information, contact Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402; (714) 885-3959; fax (714) 889-9307.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects", we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1993. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

SUPER SOLUTION

Verne Morrison of Eureka, CA, used Scale Research plans to scratch-build this model of the 1931 Laird Super Solution racing biplane. The model is powered by a Webra Bully engine, and it has a beautiful dummy radial engine in the cowl. Other details include flat flying wires, scale tail-wheel assembly, and rivet and screw-head details along the panel lines. Scale mass-balancing weights have also been added to the ailerons to ease the flight loads on the control surface. This is a beautiful model of a rarely built classic racing bipe!

POP'S BIPLANE

Two-and-a-half year old Jordan Spoon looks pretty proud of daddy's Godfrey Ultimate Biplane on this sunny flying field in Walkertown, NC. Mark Spoon's model is powered by a Precision Eagle 4.2ci gas engine turning a 20x11 Zinger wooden prop. The model is finished in Top Flight's MonoKote and weighs 21 pounds, ready to fly. It's a year younger than Jordan and still flying well.

BILL'S BABY BI-PLANE

Bill Henry of Mashpee, MA, built this beautiful model Fly Baby BI-plane from the Balsa USA kit. The 25-pound model is powered by a Kavan 50 twin-cylinder engine. A Futaba 7-channel radio guides this classic home-built model, and a Seimens battery backup system is included for insurance. The model has no bad habits, and it lands like a feather.

BLUE FLEET

This 1930's Fleet Biplane, which was scratch-built from Gary Brown plans, is the work of Bob Covington of Charlotte, NC. Powered by an O.S. 70 Surpass 4-stroke engine, the model has a 57-inch wingspan with 860 square inches of wing area. Covered with MonoKote, this bipe took three months to build. Bob says that more than 23 flights have proven its success.

PILOT PROJECTS

PERFECT PITTS

Ron Webber of Spring, TX, built this model Pitts S2-A biplane from a Pilot kit and painted it to reproduce the full-size Pitts in the background. The model is 1/3.5 scale and has a wingspan of 68.5 inches. It is powered by an A&M Sachs 3.2ci gas engine and controlled by a JR radio. The superb finish is PPG Duracryl paint over Supershrink Coverite. Ron says the model flies well and that it placed second in both the Team Scale and Craftsmanship categories at the Meyer Memorial Show in Irving, TX.

RED RAZOR

Ron Weiss of Huntington, NY, scratch-built this 1/3-scale model of the Fokker D-VIII WW I fighter, and he powers it with a Kioritz 2.4ci gas engine. The 29-pound model, which has been flying since 1984, is cloth-covered and has a metal cowl. The red Hun-in-the-Sun looks as good on the ground as it does on the wing, searching for unsuspecting Sopwith Camels. Ron will soon be selling plans for the model.

JIM'S 28-C1

Jim Praina of Shrewsbury, VT, spent four enjoyable months building this Newport 28-C1 from a Proctor kit. The model has an 80-inch wingspan, is powered by a Super Tigre 3000 glow engine and is controlled with a Futaba 4-channel radio. Recently retired, Jim says he will be doing a lot of building and flying in his free time.

CHITTY'S FLYING RAZOR

Submitted by Russell Davis of Tucson, AZ, this 1/4-scale Fokker D-VIII was built by Rick Chitty, a member of the Tucson Radio Control Club and the Barnstormers Air Show Team. Rick's Flying Razor was scratch-built from Scratch-A-Plane plans, and Rick says he's still slightly cross-eyed after hand-painting all the characteristic lozenge camouflage. The model was first powered by a Quadra 35 gas engine, but its performance was less than great. After replacing the engine with a Q-50 and adding nose weight, Rick finds that the model now flies well. As with all WW I tail-draggers, however, the plane can be a little squirrely on the ground.

CENTER ON LIFT

MICHAEL LACHOWSKI

LANDING TIPS

LAST MONTH I talked about launching, so this month I'd like to switch to the other end of the flight—landings. The first topic is a technique for avoiding short landings. Next I'll discuss landing skids, which are your glider's brakes on land. Since this column coincides with the start of the flying season, I'll also suggest some gliders that I believe are among the most fun to fly. Soar Tech No. 9 is now available, so what's in it? The last topic is about an abrasive product that you can use on that winter building project you still haven't finished.

AVOIDING SHORT LANDINGS

Everyone likes to land his glider close to the launching point, partly to show his command of the glider, and also to avoid an unnecessary walk. With most designs, landing glide-path control is provided by either spoilers or flaps. Both of these devices kill the lift to bring the glider down to the ground. This is great if your approach is high, but what do you do if it looks as if you are going to land short?

The most common reaction to landing short is to pull in some up-elevator. Up is the direction you want, but remember what the elevator really does. It controls speed, not altitude. If you're at a certain altitude, your current glide path will only take the plane a certain distance before it touches down.

On approach, you're probably flying at your minimum sink rate. This is great for staying up in the air but not for covering distance (the minimum sink rate maximizes time in the air, not distance covered). To cover distance, you want to switch to the best glide angle, i.e., one that corresponds to the maximum lift/drag ratio (L/D). You probably don't have a trim setting for this flight speed, but you do know that it's at a speed faster than the minimum sink-rate flight speed.

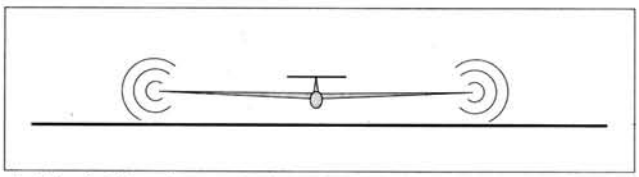
Two ASW-20s at the 1992 York, PA, soaring meet. The ship in front was built by Rick Wyckoff. The other was built by Terry Luckenbach. Flying this type of ship is quite a thrill.

At this point, you have to learn to ignore the up-elevator habit you have formed—push the nose down to increase the flight speed on the landing approach. Once you increase the speed, release some of the down-elevator, but don't let the glider's nose come up and stall. Let your glider cruise and then, just before touchdown, use a little up-elevator to slow down. When you first do this, don't try for a spot; just observe how much distance the glider covers before landing. It's probably a lot farther than you expected. If you're having problems with the glider ballooning after speeding up and then stalling, check out your CG location. You are probably flying with the CG too far forward.

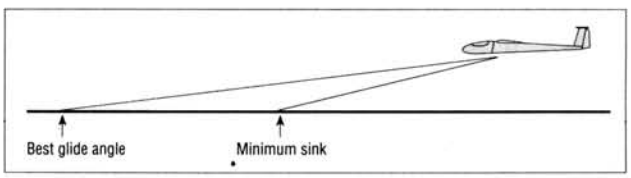
If you are good at controlling altitude, you can cruise in at high speed from far across the field, just inches above the ground, for a stealth landing. This approach is helpful on windy days because it extends the distance you can cover when it appears that you will land short. By flying low to the ground, you are also flying into a slower headwind. The closer you are to the ground, the slower the wind speed. (One could also speculate that there is some increase in efficiency because the ground breaks up the wingtip vortices, and this eliminates some of the induced drag.) You must be down in the 1-foot altitude range for a 10-foot glider to get a significant improvement.

LANDING-SKID PLACEMENT

Landing skids, sometimes called "shark's teeth," act as brakes when you land your sailplane. A few people have put vicious-looking teeth or fins on their models, resulting in the occasional comment that they should be banned for safety reasons.



A glider is flying in ground effect when its altitude is about 10 percent (or less) of the wingspan. The ground breaks up tip vortices; this reduces induced drag, thereby allowing you to really grease it in for an impressive stealth landing.



By flying at the best glide angle (the angle that achieves the maximum L/D ratio), a greater distance can be covered and a short landing avoided.

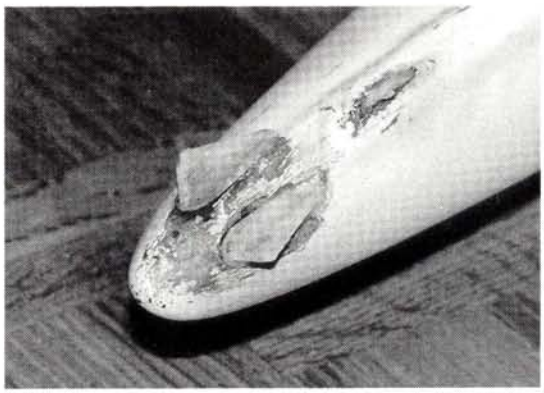
In any case, skids are effective in reducing sliding on landings. They are almost a necessity if you plan to compete, unless, of course, you have plenty of time to practice. Even sport fliers like to land close by to avoid a long walk to the model. Skids can also prevent models from sliding into other fliers if, owing to pilot error, a landing is too close to the pit or the winch area. Whether to use skids is your decision. Just use common sense.

Skids should be positioned so that they will do the best job of slowing a model on landing. There are two points on the model where you need a skid. One is near the front of the nose and the other is farther back, where the fuselage contacts the ground while the plane sits flat on the ground.

My favorite fuselage skid is made of Carl Goldberg* wingtip skids. These triangular nylon pieces with two nylon pin extensions are mounted through the fuselage wall. For a slip-on nose cone, these pins must be cut to the thickness of the cone's wall. To get extra thickness, I use CA to attach a spruce strip outside the cone. The skid is glued in place with PlastiZap*. This CA is made for plastics and seems to work well with the skids. For extra assurance, put a layer of fiberglass over the outside skid mount and spruce. This installation holds up well unless you like landing on pavement.

Most fliers put one skid near the nose. You can improve landing control by using two skids—one on each side of the nose. With two skids, both contact the ground on a straight landing. If the model touches down rolled slightly to the left or right, e.g., if you are trying to turn toward the landing spot, one of the two skids will hit square on the ground. Since the skid is offset, the model will turn on landing toward the landing spot or strip.

The second skid location is farther back on the lowest part of the fuselage. Put the fuselage on a flat surface, and find the area that contacts the flat surface. This is the location for the rear skid. This skid is needed to brake the model when you grease it in and slide it for a distance to complete a nice smooth landing. On a larger model, you may need to add a skid between these two locations.



Dual offset skids have the advantage of turning the glider's nose toward the landing spot when they contact the ground on off-center landings.

SCOTCHBRITE ABRASIVE PADS

To get a nice finish, you have to sand between coats to remove fuzz, dust and minor blemishes; 3M makes a great product for this job. Called "Between Coats Finishing Pads" or "Scotchbrite," it's available in hardware stores. It's an abrasive ¼-inch-thick nylon pad that works just like steel wool, but doesn't leave bits of steel (which can cause black stains from iron oxides) in the grain. You can even rinse out the pads when they fill up with dust, so they last a long time. I use them to sand between coats when I finish obechi. Give them a try on your next project.

WHAT'S FUN TO FLY?

Most thermal sailplane kits fall into one of these four categories: polyhedral trainers with spans of about 2 meters; hand-launch gliders; 2-meter competition ships; and unlimited competition models just under 3 meters in span. (These typically have a wing area of 1,000 square inches and weigh about 75 ounces with ailerons and flaps.)

I have to admit that almost everything I have is designed for competition or LSF tasks. Most of the time, I fly an F3B design for competition practice. For fun, my favorite has to be the biggest model I own—a 14-foot, 9-pound unballasted (easily ballasted to 11 pounds) model that I built for long thermal flights and cross-country flying. If you have never flown a model that large, you are missing out on some great flying. The performance of sailplanes this size is outstanding, and you have to fly a long way out before the model becomes hard to see. With six servos, the model is aerobatic as well as an excellent soarer. Doing rolls with a 14-foot sailplane is awesome.

I know of a few people who love their ASW-20 scale ships designed by Terry Luckenbach*. The wing has an E214, so it is a great soarer and can keep up with the best unlimited ships. On the other hand, it's too graceful to want to dork it in on a spot landing. Kits are available from Terry for $375. Too bad we don't have a scale duration class to encourage more designs like this one.

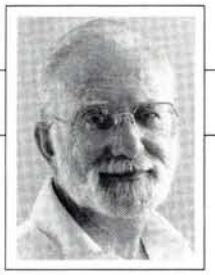
Except for trainers, most sailplane kits are designed to fit into a thermal duration competition class. If you really look at these, there isn't much variety. What would you really like to be flying? Send me a letter describing your favorite non-competitive sailplane, and I'll report the results.

SOAR TECH NO. 9 IS HERE

It has been a long wait, but a new Soar Tech* journal is now available. Soar Tech No. 9 is 126 pages long and contains six papers by such folks as Martin

(Continued on page 73)

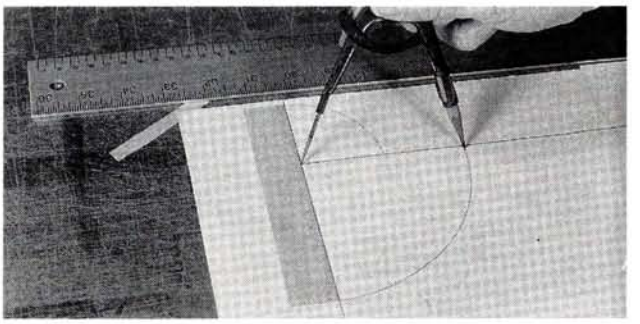
HOW TO:



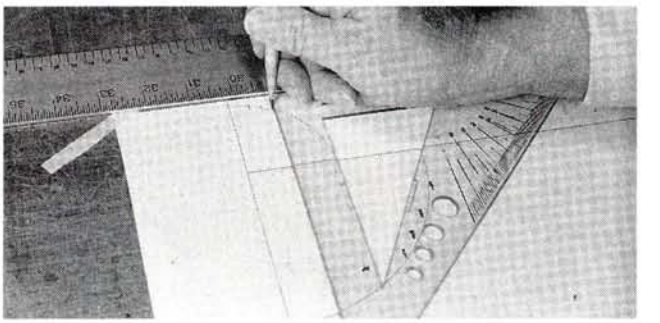
RANDY RANDOLPH

DRAW AN ELLIPTICAL WING

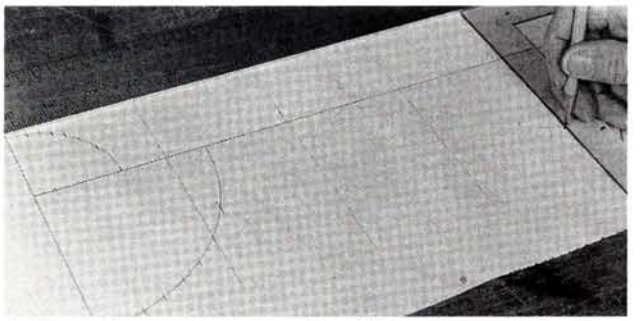
The elliptical planform is considered to be the most efficient wing shape; even if that weren't the case, it would still be very pleasing, as demonstrated by the popularity of the British Spitfire. The photos show a time-honored way to lay out such a planform. You'll need a drawing board, a T-square, a right triangle, a ruler, a pencil and a compass. The numbers shown are for a 48-inch wing with a 6-inch root chord and an aspect ratio of 10, but the technique can be used to draw a wing of any size and aspect ratio.



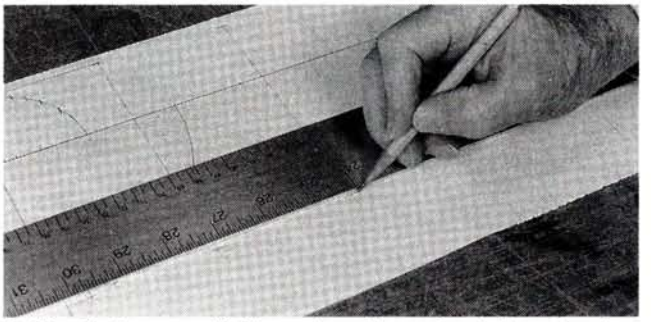
1. Using a right triangle and a T-square, draw a vertical line along the length of the root chord on one side of the paper (here, 6 inches). Divide the chord into thirds, then draw a horizontal line the length of the required half-span (24 inches) at the one-third-chord (2-inch) station. Center the compass at the span/chord-line intersection, and scribe quarter-circles, one with a one-third-chord radius (2 inches) and one with a two-third-chord radius (4 inches).



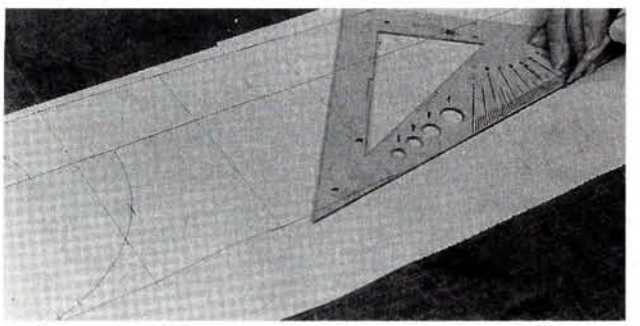
2. Use a ruler to divide each quarter-circle into eight equal parts along the span line. This would be ¼-inch segments on the 2-inch arc and ½-inch segments on the 4-inch arc. Again using the triangle and T-square, mark the spot where each segment line intersects the arc. Be accurate.



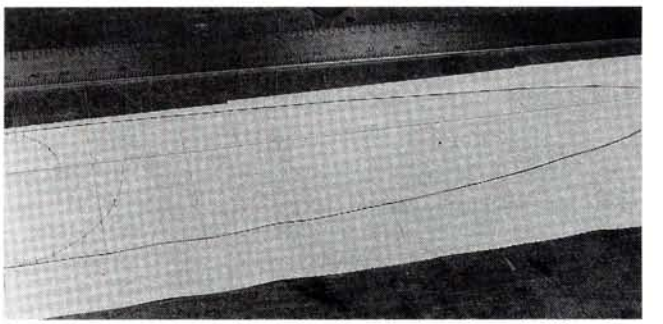
3. Be sure there are the same number of intersections on the larger arc as there are on the smaller one. As with the quarter-circles, divide the span line into eight equal parts (3 inches, in this case). Draw full-length chord lines at each station. These aren't necessarily rib positions; you can draw them in in later.



4. Align the T-square with the marks on the quarter-circles and make a mark where the T-square intersects its corresponding spanwise segment line. For example, the first mark on each of the quarter-circles nearest the center chord line should correspond with the mark on the first spanwise segment line, the second with the second, and so on.



5. Connect the marks on the spanwise segment lines. A straightedge works well, but if you pin a balsa strip to the drawing board, you can trace around it to form nice, smooth curves. The end of the wing can be drawn with a French curve or freehand.



6. This is the completed elliptical outline for a hand-launch-glider wing. This system works as well with control surfaces that have much lower aspect ratios, such as tail surfaces, or wingtips on constant-chord wings. Simply change the ratio between the center chord and span lines. A "How To" in the May '92 issue shows you an easy way to make the ribs for such a wing.

MODEL AIRPLANE CONSTRUCTION NEWS MAGAZINE

FUN-FLY MISSION; DART-LIKE STABILITY

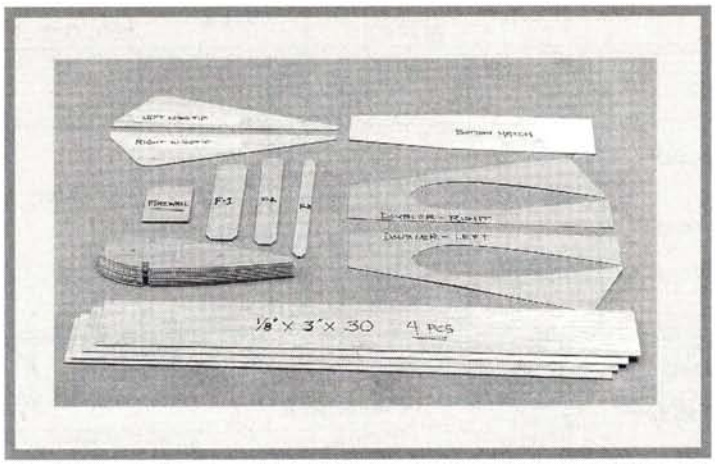
by BLAINE STETLER

Kenny Martin, 11, pilots his Notforsale. (Photo by Jeff Tibbetts.)

Below: left to right: Kenny Martin (kneeling), 11, of Summerfield, FL; Scott Roddenberry, 15, Floral City, FL; Josh Courter, 16, of Crystal River, FL; Beau Terrell, 14, of Invernass, FL; Michael LaRosa, 17, of Invernass, FL; Gary Plutta, 15, of Lecanto, FL; Glenn Hawkins (kneeling), 12, of Lecanto, FL; Aaron Monier, 15, of Invernass, FL; and Blake Thorpe, 12, Hernando, FL. All of the nine are or were Blaine's students; five are flying Notforsales. (Photo by Phil Courter.)

NOT FOR

PHOTOS BY JEFF TIBBETTS AND BLAINE STETLER



The initial parts have been "kitted." Take extra care when cutting out the doublers.

IN 1955, WHEN I was 11 years old and bedridden, my father scraped together enough money to subscribe to *Model Airplane News*. I remember what was on the cover of my first issue: an R/C airplane called the "Smog Hog" held by Howard Bonner and a control-line model—the "Thunderbird"—held by Bob Palmer. You old-timers will remember both of these guys. The Smog Hog wing was eventually modified and used as the inspiration for the low-wing Astro Hog—originally kitted by Berkely and now by Sig Hobbies. I believe Bob Palmer went into the AMA Hall of Fame.

When I received that first issue, I was hooked on model airplanes, hook, line and sinker! To have *Model Airplane News* publish this design for the Notforsale 37 years later is, for me, quite a thrill. Over the years since then, I have learned to fly reasonably well with the aid of some very good friends. After going through (destroying) three or four planes, I could take off, fly around and successfully land. Eventually, I decided to help others learn to fly, and I have trained a few dozen new R/C pilots in recent years, many of them very eager youngsters.

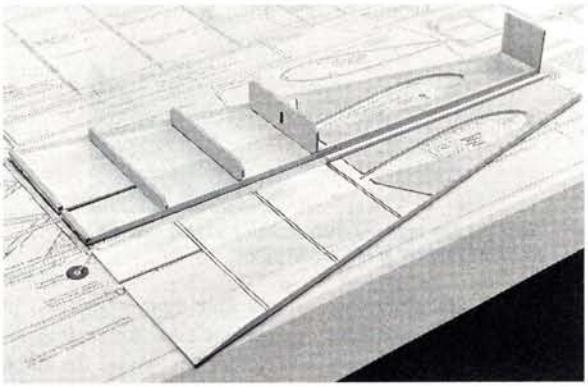
Lately, I have been building kits for other people, mostly scratch-building for myself, and testing aircraft after aircraft. I rebuild crashed airplanes, make them flight-worthy, and then someone buys them from me so I can go on to the next project. Finally, I decided to design a totally different airplane, and the result is the Notforsale (see "Behind the Notforsale" sidebar). There are about a dozen flying now, and the design has proved to be as reliable as it is popular.

CONSTRUCTION

Start by cutting out the major parts from the plans. I cut out the 1/32" aircraft ply doublers (two pieces), the wingtips, ribs (10 pieces) and the firewall out of 3/16" aircraft ply, the three formers F1, F2 and F3, and the bottom hatch out of 1/8" lite-ply. Use care, especially when cutting the doublers; these are two of the most critical parts of the kit!

Fuselage. Select four good pieces of 1/8" balsa, 3" wide by 30" long. If they are warped, straighten the edges using a metal straightedge and a sharp X-Acto knife, so they fit firmly against one another. Fit two pieces together, and use six pins to hold in place, allowing approximately 2" between. Use 3/4" or 1" masking tape to hold the pieces together. Remove them from the board, turn them over and apply some medium or slow CA. Holding the joint open, apply the bead the entire length of the sheets, then lay the sheets on a perfectly flat surface with the tape on the down side until the glue has set. Do the same now with two more pieces.

Join these two pieces of 6"-wide stock using the technique described above. Now you have one 12"-wide piece that will create both body sides. Remove masking tape immediately after the glue has set, pulling it off at a 90-degree angle. Sand to your taste—both sides. Set this piece on the plan and mark one end the height of the firewall minus 1/8". It should be approximately 2 3/4" from the bottom of the sheet. Rotate the piece 180 degrees and similarly mark the other end. Using a straightedge, draw a diagonal line from one mark to the other, and then cut on the line. I use three or four mild pressure cuts to avoid running off the mark. You now have two roughed-out fuselage sides. Lay the two roughed fuselage sides together on the plan, and trim the front and aft edges straight, per the plan.



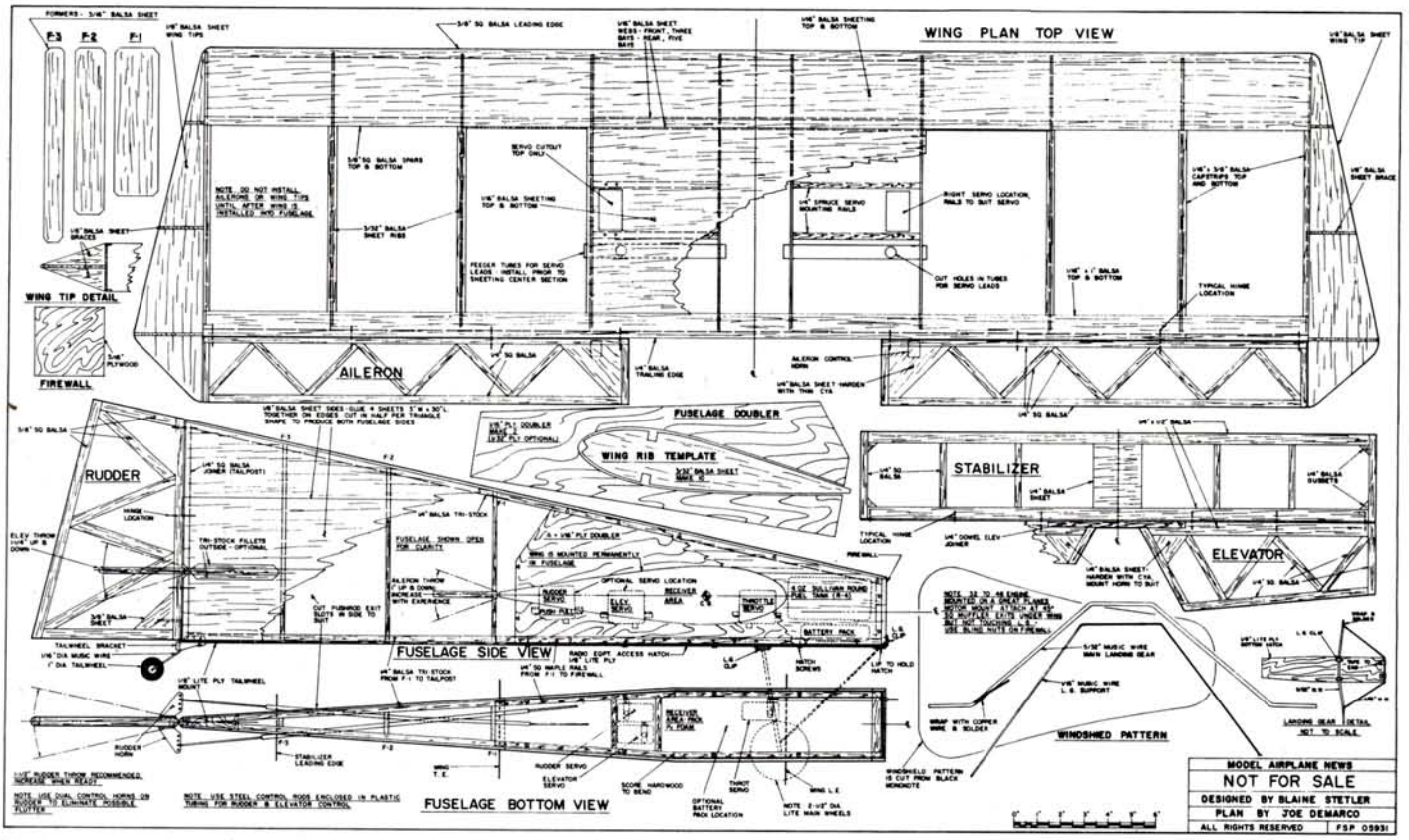
Formers in place, the fuselage halves begin to take shape.

Next prepare to glue your 1/32" ply doublers to the side pieces. Make sure you mark for a left side and a right side, and glue the doublers in place using slow CA or epoxy. Lay one side over the other and cut out the tail and the

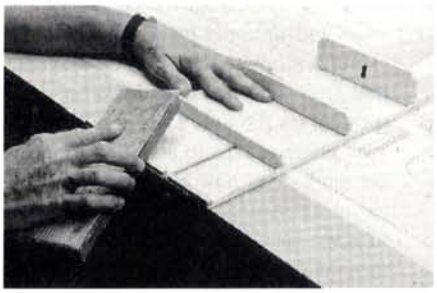
SALE

SPECIFICATIONS

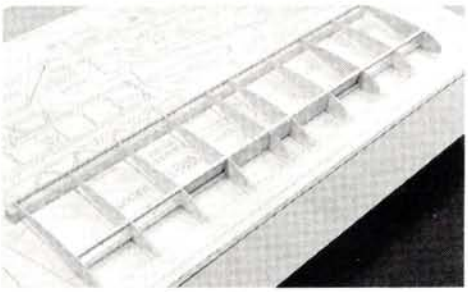
Name: Notforsale
Type: Sport/fun-fly
Wingspan: 53 inches
Total wing area: 744 square inches
Weight, ready to fly: 3 1/2 to 5 pounds (4 pounds or less for sport fun-fly competition)
Wing loading at 4 pounds: 12.4 ounces per square foot
Airfoil: symmetrical (constant chord)
Dihedral: none
Overall fuselage length to nose: 36 1/4 inches
Vertical-fin height: 10 1/8 inches
Recommended engine size: .32 to .46
Fuel tank: 4-ounce round (Sullivan)
Landing gear: formed wire (soldered)
No. of channels: 4 channels (ailerons, elevator, rudder, throttle); five servos (two on Y-harness for ailerons).



ORDER THE FULL-SIZE PLAN...PAGE 121



The tail section is tapered with a sanding block so that the two sides will properly join.



Note the five rear 1/16-inch webbing pieces that are glued to the rear of the center spars.

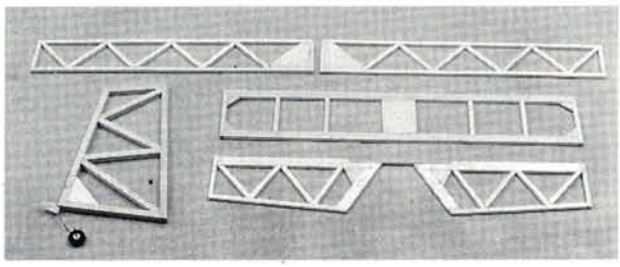
wing insert. When you've completed this airplane, you will swear that the engine, visually, has upthrust. The triangular fuselage produces this visual effect, and you will be tempted to add washers to your engine mount. Don't! Just make sure at this stage that everything is straight and in line.

Now lay the sides over the plan and mark your former locations on both fuselage sides. Glue 1/4" balsa triangle stock along the top of both inner fuselage sides and along the bottom inside edge from the tail to the front edge of former F1. Using a triangle, glue the firewalls, F1, F2, and F3 into place. Glue 1/4"-square hardwood rails from former F3 to the firewall. Use a saw to score the hardwood rails so they will bend at the point shown on the plan. Glue a 1/4" balsa piece vertically to the aft end of the tail section, and taper with a sanding block to a reasonable angle.

Glue the other fuselage side to the firewall, but do not glue formers or the tail section together yet. Fit the 1/8" lite-ply hatch to the bottom of the fuselage, align on the plans, then drill the eight screw holes into the hardwood rails using a small drill. Remove and drill out the hatch holes to the next, larger drill bit size and attach to the rails with screws.

Now, checking the vertical alignment on the plan, bend and glue formers F1, F2, F3 and the tail former (1/4" tapered piece) together. Holding the end together with several clothespins or straight pins will allow you to do this easily. You will have to trim some triangle stock at the end, top and bottom, before you glue them together. Check for straightness over plans. Lay the fuselage aside for a while.

Rudder. Build the rudder per the plan using 3/8"-square balsa. Add your triangular piece for insertion of your tail-wheel wire. Drill the hole slightly larger than your wire so you can fill with extra epoxy when you install it. This adds strength and helps prevent the wire

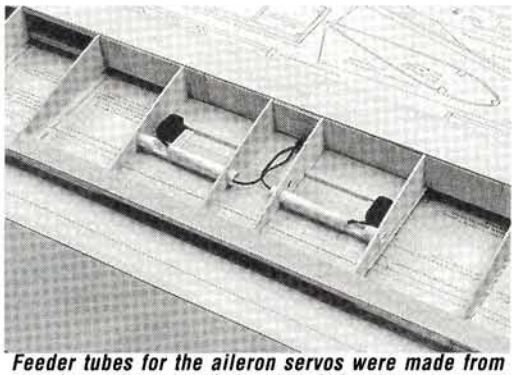


Above: rudder, stab, elevator and ailerons are of conventional construction.

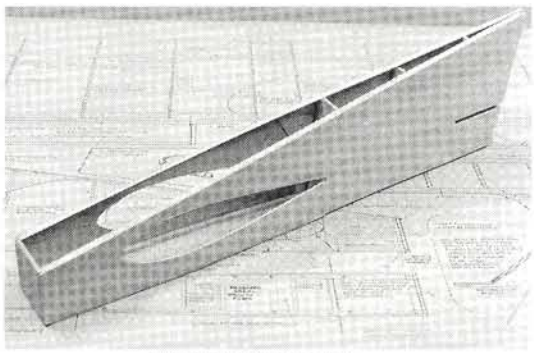
Right: the bottom hatch has been attached.

from loosening. Also, coating the triangular piece with thin CA will strengthen the whole section. This is also where your control horns will be mounted.

Stab, elevator and ailerons. Build your horizontal stab and elevator surfaces in the same way, but use ¼x½" hard balsa for the leading and trailing edges and ¼"-square for the rest of the structure. Construct elevators per plan and connect with ¼" dowel. Next, build both ailerons on one side of the plan, and flip over as per the elevator construction. At this stage, I use pins or masking tape to trial-fit all tail surfaces to the body. Checking during various stages can save you grief later.



Feeder tubes for the aileron servos were made from rolled, taped paper and glued into holes that were cut in the center ribs.



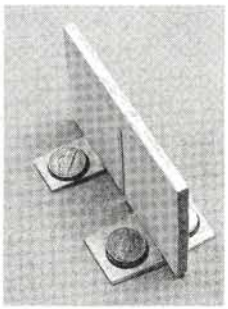
The framed-up fuselage.

Wings. Build directly over the plan. Cut to length three pieces of ⅜"-square balsa for wing spars and leading edges. Pin the bottom spar into place, angling the pins toward the rear of the wing for easy removal. Use at least one pin between every rib location. This wing is built in one piece. I use 48" stock whenever possible. At the rear, I set a block the entire length of the wing approximately 1⅛ inches high for the trailing edge of the ribs to rest on. This is to prevent wash-out or wash-in from being accidentally built into the wing. The wing should be perfectly straight, or as close as possible.

Using medium CA, tack each rib into place. I make a simple vertical holder out of some balsa scrap and weight the bottom so that each rib is true. Glue the ¼"-square hard balsa trailing edge to the rear of the wing. Weight down the rear (or pin it) at this time to your rear support block. Put your top spar on the ribs and securely glue it into place.

Glue three pieces of 1/16" webbing to the center front spars at this time using epoxy or slow Jet. Glue the five rear 1/16" webbing pieces to the rear of the center spars. If splicing together 24" spars, increase center strength with ⅛" hardwood stock webbing (grain running lengthwise), or by using lite-ply. Glue the 1/16x1" trailing edge and ⅜"-square leading edge into place.

To sheet the front of the wing, I use medium 4"-wide balsa. Cut holes in the four center ribs, and glue two paper feeder tubes for aileron servos in the center R-2 ribs. Cut a hole in each paper tube for feeding your servo leads through.



This simple rib jig ensures true alignment and is easier to use than a triangle square.

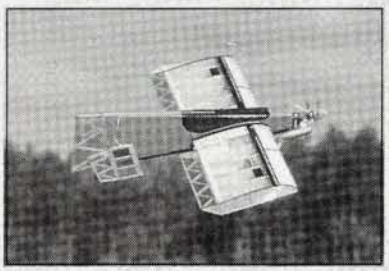
Add sheeting to all four center ribs, and add the ⅜x1/16" capstrips to each rib including end ribs (make end-rib capstrips flush with rib outer edge). Install your ¼" spruce rails for mounting your aileron servos.

Repeat the covering and capstripping process on the bottom, and sand to taste. You will next install the wing. The wingtips and ailerons are attached later—not now.

BEHIND THE NOTFORSALE

I knew what I wanted when I designed the Notforsale: an airplane that would be good at sport fun-fly competition, controllable, particularly docile at slow speeds and capable of flying well when inverted. But I wanted a body—not a boom for the fuselage—and an airplane that would immediately correct itself and slow down drastically when throttled back.

Every unusual characteristic of this plane is there for a reason: thick tail surfaces for increased tail-end drag, ailerons starting 3" away from the fuselage to allow air to flow for uncluttered elevator response, an uncowled engine for best engine performance and cooling, and a triangular fuselage that simulates a vertical airfoil for immediate directional correction and possible knife-edge flight.



It came out a little ugly—like my Pekingese—but I love my Peke! You should have heard the comments when I took my partially framed-up original to one of our club meetings. "Which way is up?" "You going to put landing gear on the top or bottom?" "That thing won't roll!" "It surely won't spin with that much body," and on and on.

So when I tested the airplane, I had many reservations. Ground control was super, owing to the lack of flex in the simple landing gear. I used both rudder and aileron when taxiing in the wind, and the wind didn't bother it, even with the massive side area.

I opened the throttle on the ASP .46. Airborne in about 8 feet; it gained some altitude so I throttled back to one-third power, and flew it around gently for a few minutes (to stop my hands from shaking). Then I proceeded through a series of rolls, loops, (inside and out), spins (both right and left), crazy-8s, and sustained inverted (surprisingly requiring no trim adjustments). The fuel (4-ounce tank) ran out in about 10 to 15 minutes, and it coasted in for a dead-stick, three-point stall landing.

I was as amazed as anyone at the field, so we took off again, throttled it back to half speed and passed the transmitter around. We flew it until the battery was too low.

Then the questions came: "How much do you want for it?" "Will you sell it?" "Can I buy it?" To make a long story short, my answer was, "Guys, this is my airplane, and it's not for sale!" In the next couple of weeks, the same thing happened at several other area clubs.

So, one night after a couple of drinks (I believe it was tea?), I took an X-Acto knife out and cut some letters out of MonoKote and put them on the side of the airplane. Thus, it was christened the "Notforsale."

INSTALLING THE WING

Carefully feed the wing through until it is centered. Make sure the top of the wing with the servo cutouts faces upward. At this stage, I like to pin everything together in a trial alignment before I glue anything else. With the bottom hatch plate attached, set the whole plane on a flat surface, insert the horizontal tail, and block the tail and wing up equally. Pin the tail surfaces, ailerons and wingtips into position. Check and double-check for alignments.

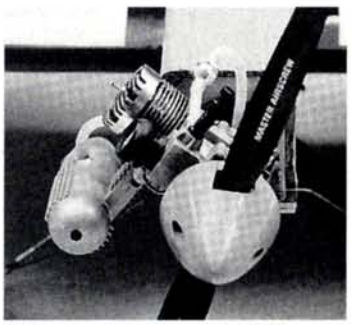
Tack the wing where the sheeting touches so it can't shift; put masking tape on the outer surface of the wing/fuselage joints; and apply 5-minute epoxy to the inside of the wing/fuselage joints (this forms a fillet). You can also use CA with soft triangle stock to reinforce the bond for strength.

Horizontal tail. Insert the horizontal tail and align carefully. Visually check that it is as straight as your wing. Measure the distance from the leading edge of the tail to the trailing edge of the wing to make sure both are equal; CA into place.

RADIO INSTALLATION

All your radio gear is installed in the bottom of the fuselage (via the lite-ply hatch) before you sheet the fuselage top and bottom.

Servos. I use full-length 2/56 rods threaded at one end enclosed in nylon tubing. I prefer to have the control horn on the top of the elevator, so in a pullout from high power dives, the servo is pulling and you have no possible flex. Install dual linkages to your rudder. This is to safeguard more effectively against flutter. Remem-ber, the tail section is made intentionally thick and large; the tail's drag maintains directional stability, especially when you throttle back. Epoxy all control-rod guide tubes at formers F2. Install servos in the bottom wing section by cutting out parts of the wing sheeting and gluing in ¼" hardwood servo mounts.

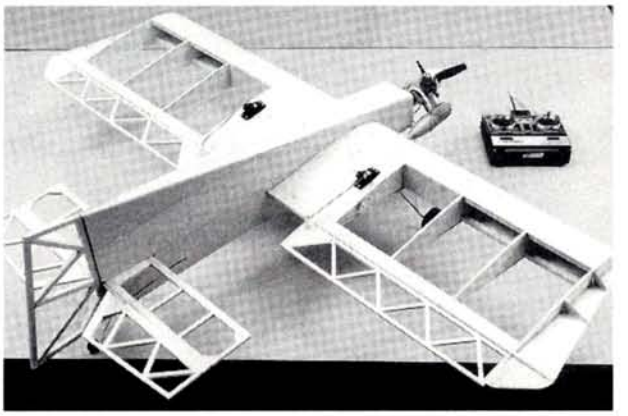


Mounting the engine at a 45-degree angle keeps oil away from the servo in the top of the wing and directs the exhaust below the wing.

WRAPPING UP

Attach your bent tail-wheel wire to the rudder, as shown on the plans. Make sure one rudder hinge is at the very top of the fuselage tail. Test-attach your ailerons to the wing—leave at least ⅛" for clearance for the wingtips—and place a hinge at the end of each aileron. Glue on the wingtips and sand to shape, then CA the soft wingtip covering guides into place (see plans).

Landing gear. Solder your landing gear together; I use 5/32" wire for main and 1/16" for forward support wire. Wrap copper wire at the connecting point after cleaning and sanding the area to be soldered. Using a small torch, solder well and let cool. Attach the main gear to the hatch.



The Notforsale is completely framed.

Engine mount. Position and drill the firewall, and mount the engine (.32 to a .46). Strive for accurate centerline thrust. Mount the engine at a 45-degree angle. This keeps fuel away from the servo in the top of the wing and causes the exhaust to exit below the wing. Make sure the engine doesn't touch the landing-gear wire.

Glue on your ⅛" ply tail-wheel adapter mounting. Using ⅛" balsa, sheet the top and bottom (aft of the hatch) of the airplane. Attach the hatch retaining lip. Be creative when covering. A "Notforsale" will be recognizable as a "Notforsale" no matter what the color scheme! Just one hint: make the top of the wing totally different from the bottom, so you easily can tell if the plane is inverted in the air. Attach all control surfaces, and I recommend that you pin all hinges.

Fuel tank. Install a 4-ounce round tank; you may have to trim away most of your leading edge, but don't worry. A 4-ounce tank will give you 8 minutes full-bore with the ASP .46. Install throttle servo and linkage to the engine. I use a micro Airtronics servo. Any full-size servo is acceptable, but the lighter the airplane, the more competitive it will be.

FLIGHT TESTING

Make sure your balance is at the indicated CG. If you are a novice, have your controls checked out by an experienced flier, and allow him or her to test-fly and trim the controls for you. Pick someone you know and trust! Don't rush! With the recommended throws (see plan) the plane will be very gentle on the ground and in the air.

Take off directly into the wind using a moderate amount of "up" only after the airplane has reached a good speed. Once in the air, reduce to approximately half to two-thirds throttle, and climb moderately to a minimum of 100 to 150 feet.

With plenty of altitude, try some loops, rolls, etc. If it is at all "squirrely" (erratic), your CG is too far back and you are tail-heavy. If it is "doggy" (slow to respond) you are nose-heavy, but, either way, the airplane should land easily if throttled back to idle. Just keep the nose level or a hair down on your landing. I recommend that, on your test flight, you place the battery pack under the tank. If the plane does not loop or spin fast enough, move the pack back to the optional position shown on the plan.

A few words of warning on any test flight (for low-time pilots). Major causes of failures on any airplane are:

- Pulling the airplane off the ground (pulling too much up) before the airplane is up to flying speed, especially in a headwind or crosswind;
- Climbing too steeply with too much power (pilot then has a tendency to overreact and over-control). I call this "panic attack."
- Not gaining enough altitude before trying aerobatics. Remember, altitude is your friend and will give you a chance to recover if something goes screwy. Most "basket cases" (both airplane and pilot) involve sudden contact with the ground from low altitude!
- Out-of-trim conditions. Make sure all control surfaces are not warped and are straight with trims centered. Fly the airplane to a safe altitude before trying to adjust any of the trim controls.

Finally, once you have a couple of flying sessions under your belt and are familiar with your Notforsale, increase your throws gradually and experiment. Happy flying, people. And don't forget to pull out your transmitter antenna.... ■

HOW TO

You Need a Handstand

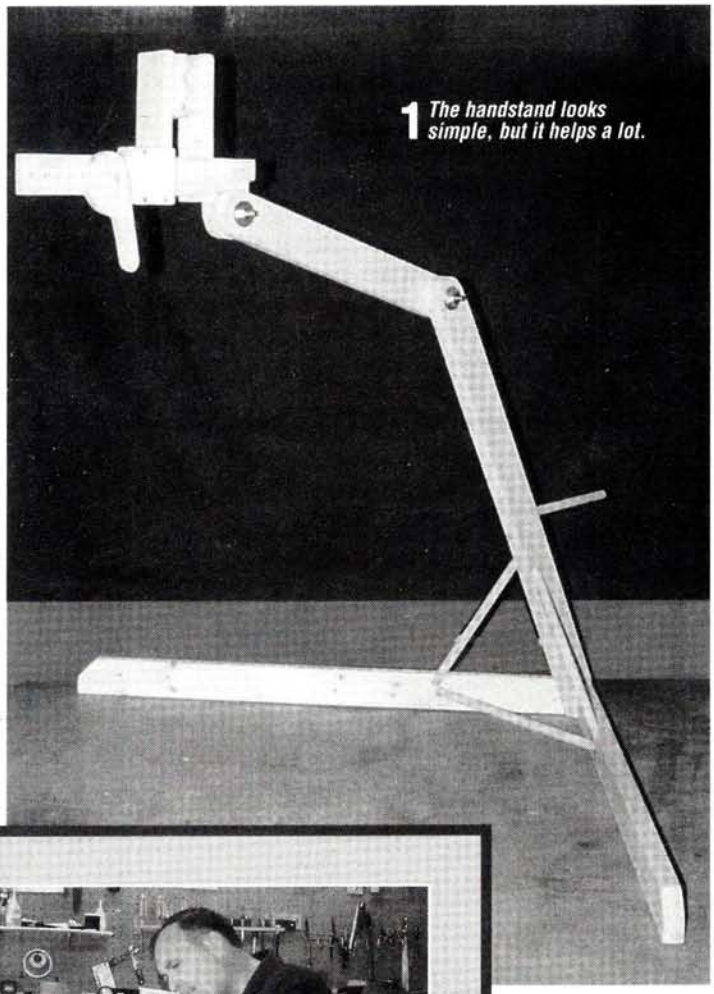
You'll wonder how you ever did without one!

by JERRY TUTTLE

IT'S BOTH a happy and a sad occasion when you realize that you've done something the hard way for most of your life. I'm sad that it took so long to figure out the error, but I'm happy that I've found something better!

Consider that we humans have two hands—one to hold the piece we work on and the other to hold the tool. This is a good system, except that we continue to design more complicated assemblies. What happens when we work on something that has two or three parts, and we use a tool and maybe even a backup tool? Somewhere in there we run out of hands.

This struck me one day as I was installing servos in my newest plane. I had the airplane on its wheels sitting on my bench. I tried to hold the airplane, the servo with the grommet and the eyelet, and the screw with the washer and the screwdriver. Without warning, the plane rolled, and the tail wheel fell from the bench, dinging the MonoKote on the stabilizer in the process. This process, which was totally out of my control, continued as every piece sought its lowest energy state. Quietly uttering a mild expletive, I accidentally dropped the servo, lost the screw inside the fuselage, kicked the screwdriver across the floor and watched the plane get dinged some more as it rolled off the bench. Sound familiar?



1 *The handstand looks simple, but it helps a lot.*

You know exactly what was wrong. I needed a hand for the airplane, a hand for the servo and a hand for the screwdriver. That's one more hand than I have.

I have tried all the common solutions: sandbags, pillows, phone books—whatever I could find to weight down the pieces while I work. These hold the work, but only loosely, and at a height and position that never seem to be right. A handstand solves this problem by holding your work firmly in any position that you choose. What's more, it's easy to build (it only takes an afternoon), and it's inexpensive ($20, tops).

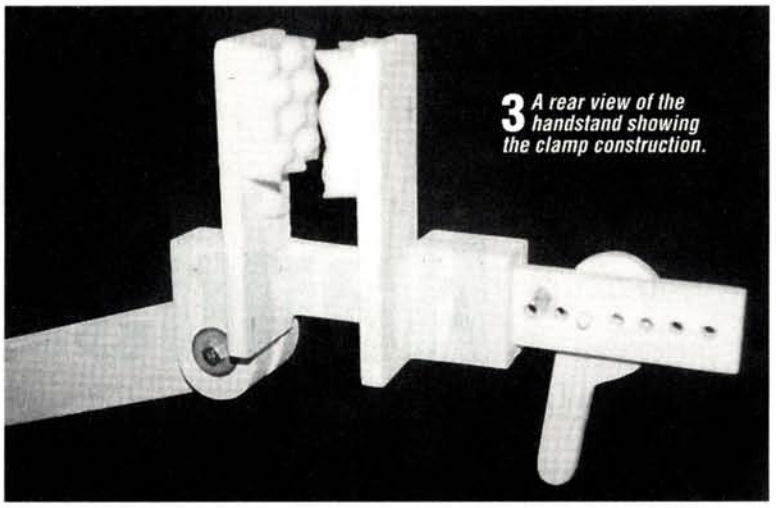
Note the widely spaced, stable feet in photo 1. The spine and the triangle brace form a rigid joint to the feet, and the two ½-inch pivot bolts allow you to position the stand at a comfortable working angle. The clamp has a simple cam-action jaw that accepts a wide variety of shapes. Both clamp surfaces are faced with protective foam-rubber pads.

CONSTRUCTION

Photos 3, 4 and 5 show the construction details. Although the dimensions of the stand can vary somewhat, I like the size and angles of my handstand, and I recommend that you make yours similarly.

Make the feet from a stud-grade 2x4 that's cut in half. Use another 2x4 to make the spine, the arm and the wrist joint. A 6-foot 1x4 will be used for the hand and clamp assembly. In addition, you'll need two 1-inch dowels that are 3 feet long. You may notice that the cam lock on my handstand pivots on a ½-inch dowel. Use a piece of the 1-inch dowel from the leg-to-spine joint; it will make the pivot more positive, and you won't need to buy another smaller dowel.

2 *Isn't this better than sandbags, phone books and pillows?*



3 *A rear view of the handstand showing the clamp construction.*

If you have a strong power drill with a Phillips bit, use dry-wall screws instead of nails. These screws are stronger and more precise. I used two screws on each foot-to-spine joint, four on the sliding clamp collar and two to hold the stationary hand to the wrist joint. To ensure a firm hold, also use glue on every stationary joint. Titebond or Elmer's carpenter's glue is perfect for this job.

HOW IT WORKS

One of the opening photos shows some "brain surgery" in progress. I'm installing a camera in the fuselage of my Ace 4-60 monoplane. Notice that the handstand holds the plane at just the right angle so that the camera and servo linkage are easy to install. Better yet, I have *both* hands free to do the work.

The pivot joints require a few days to become "settled." I kept a wrench close by to adjust the bolt tension. After a few days, the joints remained tight enough to hold their position. A large washer squeezes each side of the joint between the bolt and the nut.

In photo 5, I'm repairing some damage that occurred when the pilot's judgment (mine) failed. Notice that the handstand holds the wing so that the surface that needs work is right where you want it. Compare this with chasing the wing around a table or

MATERIALS LIST

Feet, spine, arm and wrist joint
(2) stud-grade 2x4s

Feet-to-spine triangle brace
(2) 3-foot-long, 1-inch dowel rods

Hand, clamp and cam
(1) 6-foot 1x4

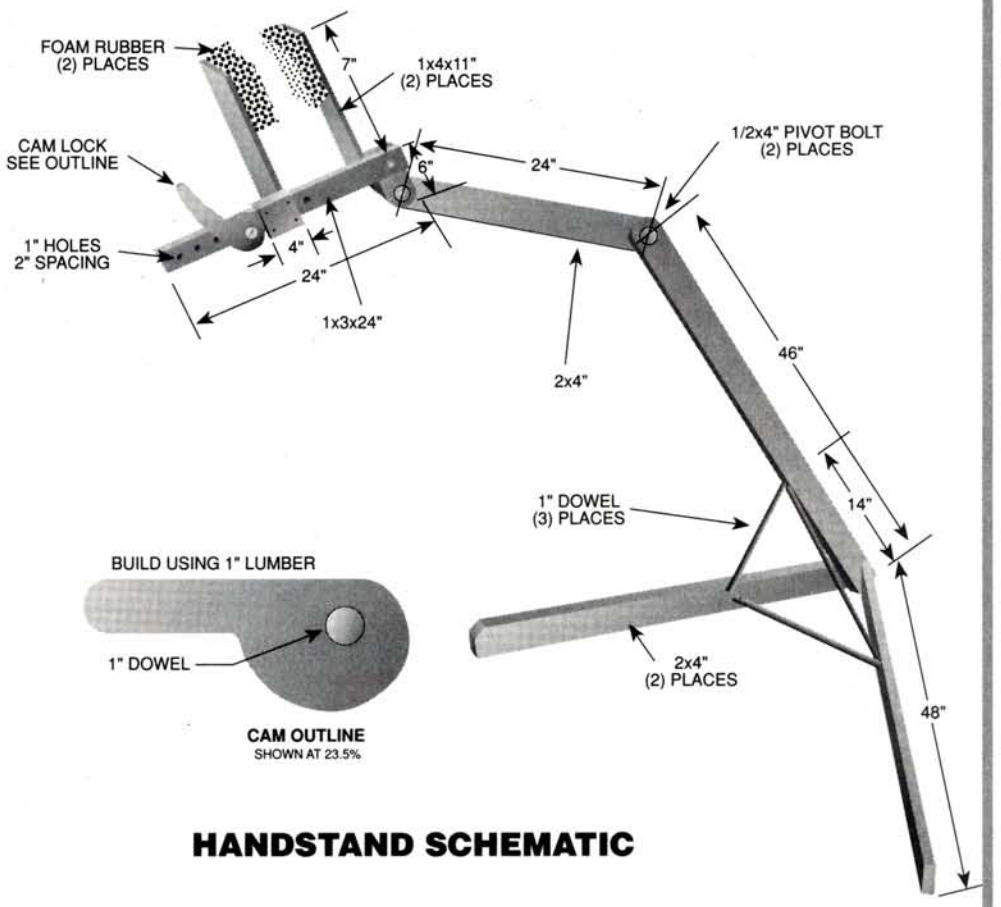
(8) 2½-inch dry-wall screws

(2) ½x4-inch pivot bolts

Pivot washers
(4) ½-inch fenders

(2) ½-inch pivot nuts

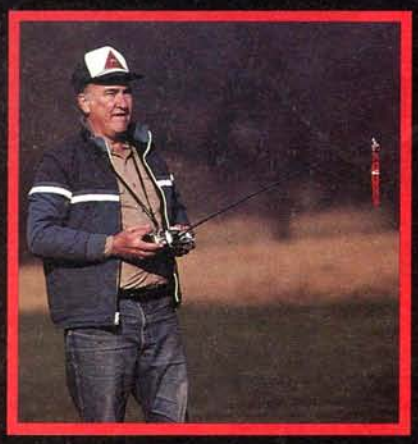
Clamping surface
(2) firm foam rubber - 4x6x2 inches



HANDSTAND SCHEMATIC

MODEL AIRPLANE NEWS MAGAZINE

FIELD & BENCH REVIEW



PHOTOS BY JIM ONORATO

by JIM ONORATO

IT SEEMS THAT every time you pick up an R/C magazine or catalogue, someone else has come out with another P-51 kit. Out of sheer curiosity, I counted the number of P-51 kits in a recent mail-order flyer. There were no less than 16, ranging from ½A to ⅕ scale! The Midwest* Mustang .60 is the third P-51 I've built, and from a flying standpoint, it's the best of the three.

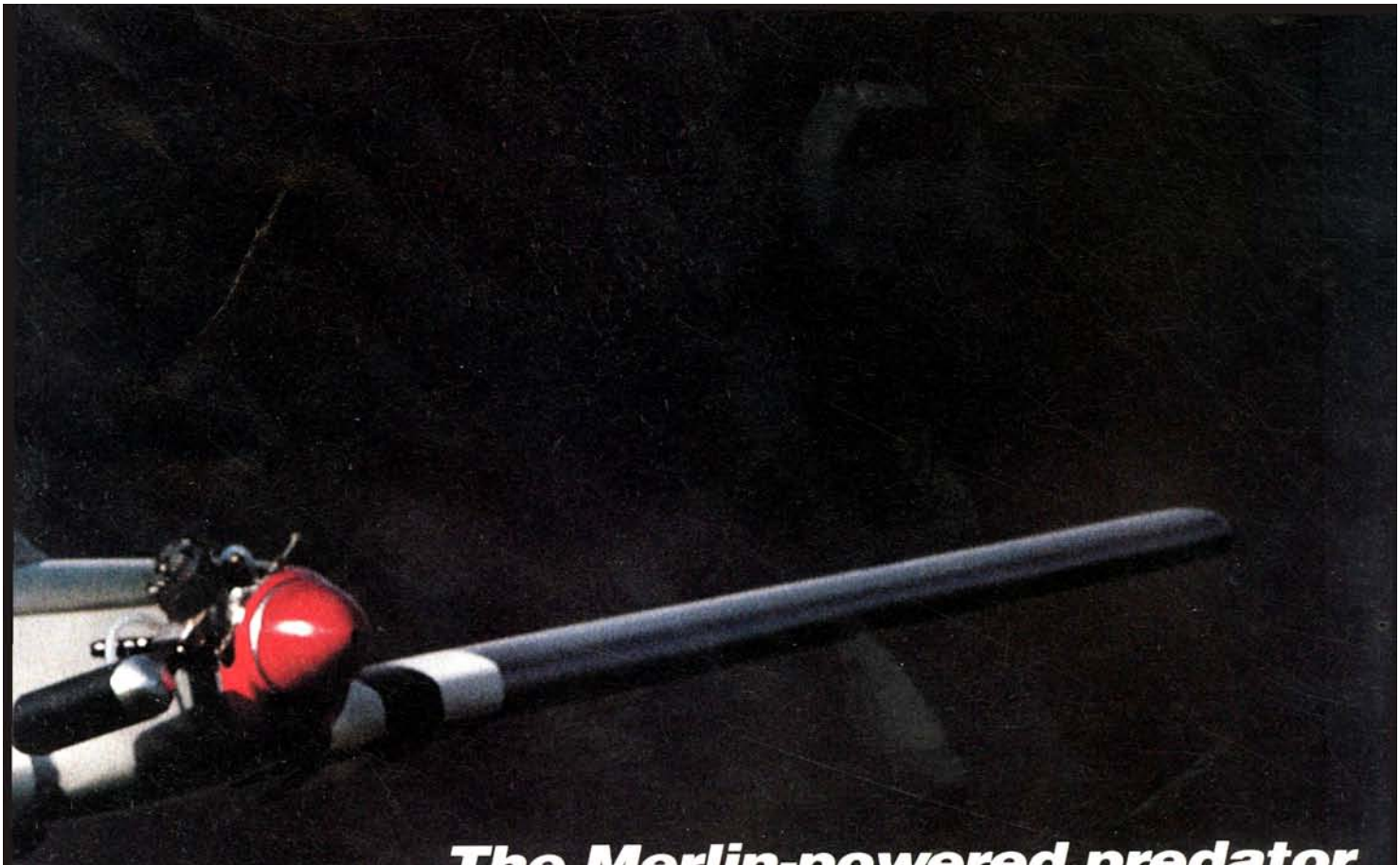
The sport-scale Mustang .60 is one of several warbirds in Midwest's Success Series. This kit was obviously designed for good flight performance as the wing and tail feathers have generous surface areas resulting in light wing loading. Although it's of simple construction, the Mustang .60 isn't intended for first-time builders; the manual assumes that the builder has had some previous experience. Nevertheless, the 44-page, step-by-step manual and the full-size plans practically ensure success. The printing on the box lid says that it's "A Big, Quick-Building Warbird That Flies Like A Sport Plane." That's an accurate statement!

WING CONSTRUCTION

Before you begin, you must decide whether your model will have retracts. The ribs and rib doublers discussed in step one are different for the two versions. The retract installation detailed in the plans and the manual shows Spring Air no.116 retracts. I used Robart* no. 606, 85-degree pneumatic retracts, and they worked fine.

Most of the construction is the same for both the fixed-gear and the retract versions. The instructions are written for the fixed-gear version, but retract instructions are provided where different parts or assembly procedures are used. The plans show installation of both fixed gear and retract gear.

The wing is double tapered with a fully symmetrical airfoil. It's built up with die-cut balsa ribs, two spruce spars and a 3/32-inch balsa leading edge and center sheeting. Simple building jigs are provided so the wing can be constructed on a flat building board. Sheer webs are cut from 3mm Micro-Lite plywood. Cap strips are die-cut balsa. Installing the leading-edge sheeting is tricky, so follow the instructions carefully, and make sure you have a perfect fit before you glue the sheeting to the leading edge.



The Merlin-powered predator for the sport-flyer

TAIL ASSEMBLY

The tail feathers are made of 1/4x3/8-inch balsa stripwood and laminated die-cut balsa parts. This framework is then sheeted with 1/16-inch balsa on its top and bottom, and this results in a 3/8-inch-thick structure that's strong and light.

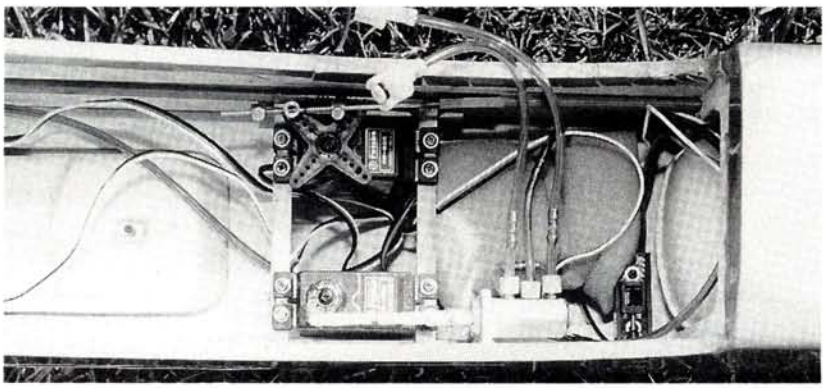
FUSELAGE

The fuselage is constructed mostly of die-cut Micro-Lite plywood. The die-cutting is excellent, and the parts fit together perfectly. I lightly sanded the edges of all the parts to ensure good bonding with CA+. The fuselage is assembled as a box. Its sides, top, bottom and formers lock together to make a strong, straight structure. I used tape and rubber bands to hold the assembly together. When it was ready, I squeezed the parts together at each joint and applied CA+. I used Bob Smith's Insta-Cure+ [5-15 second cure] on almost all joints. This gap-filling CA, when used with the accelerator, makes a good, strong glue fillet.

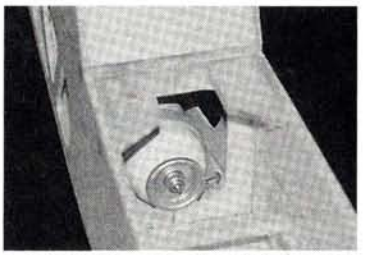
Although the fuselage sides appear to be identical, the location of the pushrod exit slots on each side is different. Look for the "left" and "right" markings on the die-cut sheets that contain the sides. The plans don't include any top view or cross-sections of the fuselage. To align everything correctly, mark the center line on two formers and assemble the fuselage upside-down over a straight line drawn on your building board. Using this procedure, I didn't have any problem getting the fuselage straight and square, but I would have preferred a top view.

The sides of the turtle deck and the forward deck are 1/8-inch sheet balsa; their tops are 3/8-inch and 1/4-inch balsa, respectively. I had some difficulty get-

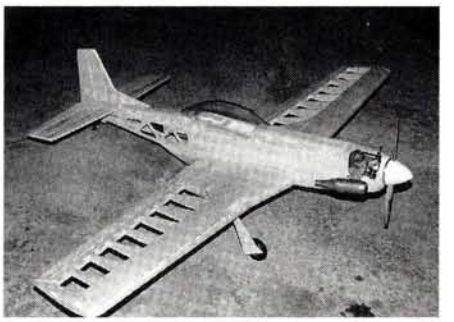
MIDWEST'S Mighty Mustang



The retract control valve, retract servo and throttle servo are mounted in the forward section of the radio compartment. With the retract air tank mounted behind former F-5, there's plenty of room in the fuselage for the additional retract components.



I installed the retracts' air tank inside the fuselage behind former F-5. It's held in place with hooks and rubber bands.



My framed-up Mustang, ready for covering

ting the 1/8-inch sheeting to conform to the contour of the forward deck formers, although I sprayed the pieces with water prior to installation.

The cowl, which is made of balsa blocks and die-cut balsa formers is an integral part of the fuselage. The top of the fuselage, the chin block and the cowl require a lot of carving and sanding.

The model has a square radiator duct and a fuselage bottom aft of the wing. I added 3/8-inch triangle stock between the sides and bottom so I could round the duct and the fuselage bottom to a more scale-like shape. I also added triangle stock to the engine compartment and reshaped the nose. The improved appearance was well worth the extra effort.

FINISHING

I covered the Mustang with aluminum MonoKote* decorated with black and white MonoKote invasion stripes and military markings. The fin was covered

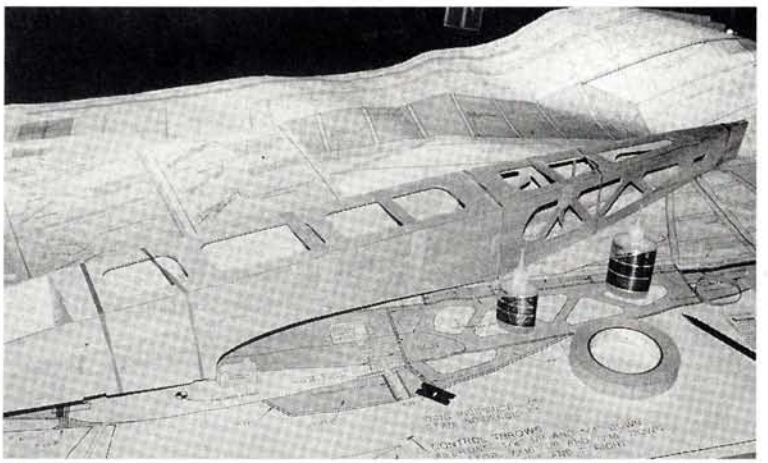
SPECIFICATIONS

Model name: Mustang .60 (Kit no.174)
Manufacturer: Midwest Products Co. Inc.
Type: Sport scale
Sug. retail price: $189.95
Wingspan: 65 inches
Wing Area: 727 square inches
Length: 50 inches
Weight: 7 pounds, 4 ounces
No. of channels req'd: 4 (5 with retracts)
Airfoil: Symmetrical
Power req'd: .60 to .90 2-stroke; .65 to .90 4-stroke
Engine used: Webra .61

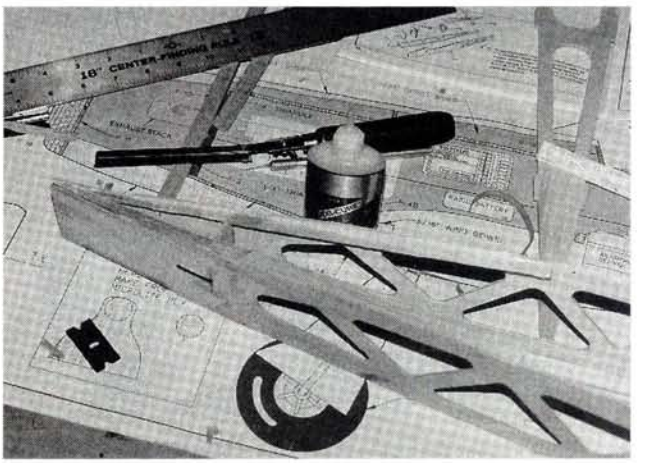
Features: the fuselage is made of die-cut, locking Micro-Lite plywood. The fully sheeted, built-up tail surfaces are light and very strong. The wing has a fully symmetrical airfoil. It uses D-tube construction with spruce spars, precision die-cut ribs and shaped and beveled strip ailerons. Hardware includes bent 3/16-inch-diameter landing gear, a tail-wheel wire, an elevator joiner, aileron torque rods, nylon control horns, landing-gear straps, a tail-wheel bracket and gear-cover fittings with fasteners. A vacu-formed canopy, exhaust stacks, a cockpit liner and military marking decals are also provided. The 44-page construction manual and computer-drawn, full-size plans detail optional retracts and 4-stroke engine installation.

Hits:
- High-quality materials and die-cutting
- Fully detailed, step-by-step instruction manual
- Excellent flight performance

Misses:
- Plans don't include top view or cross-sections of fuselage.
- Square-shaped radiator duct and fuselage bottom, (this can be remedied by using angle stock as noted in the text).



The main fuselage "box" is partially assembled and then taped and held together with rubber bands before CA is applied. It goes together easily and quickly.



The fuselage sides are identical except for the location of the pushrod exit holes. Make sure that you have the left and right sides in their proper positions before you assemble the fuselage.

FLIGHT PERFORMANCE

- **Takeoff and Landing**

The Mustang has good ground-handling characteristics. I applied a small amount of up-elevator while taxiing, and this kept the tail down and the plane tracking straight. For takeoff, I applied a small amount of up-elevator, then gradually advanced the throttle to full power. As the plane gained speed, the up-elevator was relaxed and the plane assumed a stable, tail-high attitude; a little more up-elevator let it rise smoothly into the air with its wings perfectly level. Very little right rudder was necessary to keep the plane tracking straight during takeoff. Landings were a delight! The model really slows down, and a flare just before touchdown produces beautiful three-point landings. Once on the ground, full up-elevator keeps the plane from nosing-over. The location of the tail wheel on the rudder hinge line undoubtedly helps the ground-handling performance.

- **Slow-Speed Performance**

The model flies well at slow speed, and it has an extremely low stall speed. It almost stops in midair before dropping its left wing when it finally stalls. The oversize, non-scale tail surfaces eliminate the squirrelly tendencies I've often experienced when flying scale Mustang models.

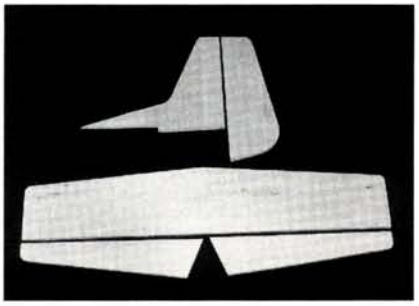
- **High-Speed Performance**

When the gear is retracted, the Mustang really moves! It's as solid as a rock at high speed, and it tracks very well. The plane showed no tendency for high-speed stalls at the recommended elevator throw of 7/16 inch. At higher throws, however, the plane will snap at the bottom of a high-speed loop. The Webra* 61 engine provided more than enough power.

- **Aerobatics**

The plane is quite aerobatic and performed every maneuver I tried. It flies as well inverted as it does upright, and it requires only a slight amount of down-elevator to maintain level inverted flight. The roll rate is impressive, and the snap-rolls are incredibly fast. Sustained knife-edge flight is a breeze! The Mustang does a perfect Helgeon circle (an outside, 360-degree, knife-edge turn). This plane is a pleasure to fly!

MIGHTY MUSTANG

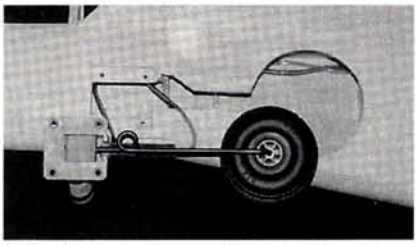


The strong, light tail surfaces are made of balsa stick stock and then sheeted with 1/16-inch-thick balsa.

with yellow MonoKote, to which I added 3/4-inch squares of black MonoKote to form a checkerboard pattern. I painted the nose with bright red HobbyPoxy* to match the spinner and covered the forward deck with olive drab MonoKote.

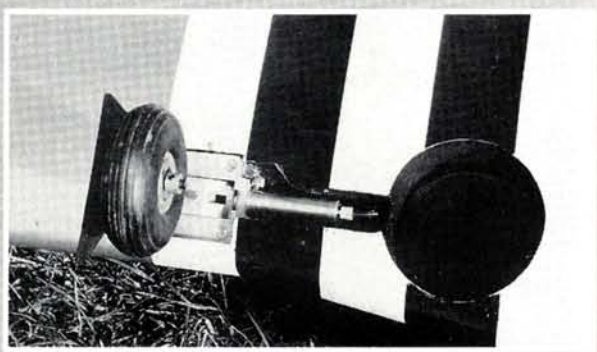
CONCLUSION

After I had completed the kit and put it through its paces at the flying field, I looked through past issues of *Model Airplane News* to see what Midwest said about the kit in its advertisements. I can



I chose to use retracts with my Mustang. Here they are, ready to be installed in the finished wing. The plans show Spring Air retracts, but the Robart no. 606 retracts that I used fit perfectly.

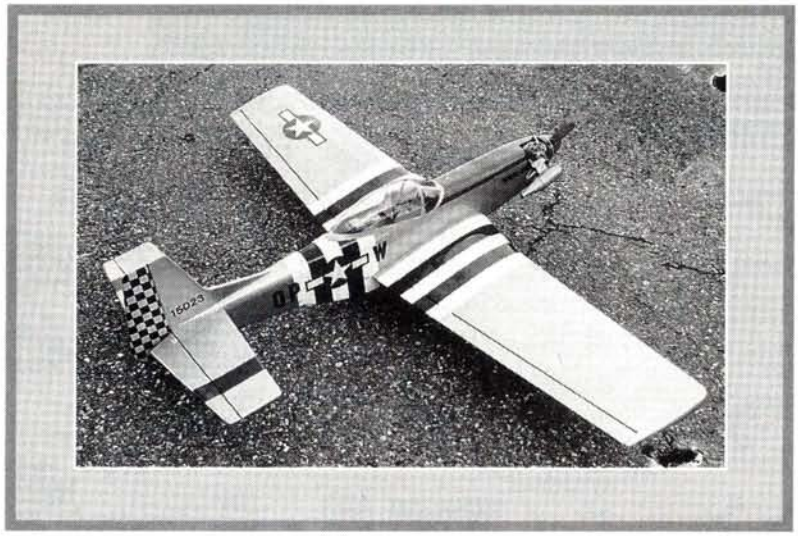
ROBART RETRACT INSTALLATION



Here are the installed retracts. The wheel well is lined with 1/64-inch-thick plywood and painted black. The retracts work perfectly.

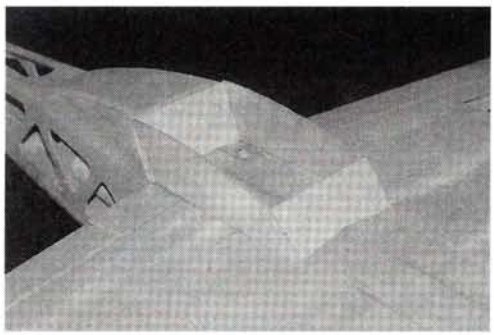
Using the Robart retract unit as a template, I cut the retract plate from the 1/4 inch plywood provided. I established the angle of the retract plate support rails by temporarily attaching the retract unit to the plate and laying both rails on rib no. 6 with the gear in the "down" position. The retract unit was angled forward so that the wheels would be slightly forward of the leading edge when the gear was down.

Then, I glued the support rails to the rib so that the rear flange of the unit would be flush with the wing sheeting. I used 4-40 flat-head bolts and blind nuts to permanently attach the retracts to the plate. The plans don't cover installation of wheel-well liners. *[Editor's note: the*



honestly say that I found all of the glowing words to be true. I highly recommend this good-looking, great-flying airplane.

**Here are the addresses of the manufacturers mentioned in this article:*
Midwest Products Inc., *400 S. Indiana St., P.O. Box564, Hobart, IN 46342.*
Robart Mfg., *P.O. Box 1247, 310 N. 5th St., St. Charles, IL 60174.*
Bob Smith Industries, *8060 Morro Rd., Atascadero, CA 93422.*
MonoKote; *distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.*
Hobbypoxy Products, *Div. of Pettit Paint Co. Inc., 36 Pine St., Rockaway, NJ 07866.*
Webra; *distributed by Horizon Hobby Distributors, P.O. Box 3726, Champaign, IL 61826.* ■



The square radiator duct provided in the kit has sharp corners. To improve its appearance, I added balsa triangular stock to the insides of the corners, and then I sanded the corners to produce a much rounder cross section.

retract instructions include suggestions for wheel-well installation.] **I used 3.25-inch wells (2.75-inch wheels) lined with 1/64-inch plywood.**

The instructions provided with the Robart retracts are complete and easy to follow. (They even tell you how to heat-treat the landing-gear wire after bending.) Don't forget the extra link that's required between the servo and the pneumatic control valve; it eliminates side thrust that could cause the valve to leak. I use a Robart air pump with a pressure gauge to check for leaks before each day's flying. I pressurize the system to 80psi. I used air restrictors in both air lines: they softened the action but did not reduce speed appreciably. ***[Editor's note: owing to the size of the air cylinders and the aircraft, scale retract speeds are nearly impossible to achieve.]*** **Overall, the Robart retracts were easy to install and they worked flawlessly.**

GOLDEN AGE OF R/C

HAL DeBOLT

A LOOK AT PAST INNOVATIONS

R/C PIONEER Frank Madl, of Des Plaines, IL, checked in again and provided us with a copy of a Dynamic Models *Model Airplane News* ad from the early '60s. Best of all are the product illustrations depicting Hi Johnson's imaginative innovations. To understand, you must realize that these offerings came far before most of us could appreciate them. No other manufacturer was even in the ballpark at that time!

The late, great Richard Branstner at the '58 Nats, tuning what could have been the first low wing at the Nats. The biplane is a Kratzet Eskimo. Photo courtesy of John Worth.

Recently, we discussed how Hi Johnson had been involved with Veco and left them to form a kit operation with Ken Adams (Ken-Hi Products). Ken-Hi closed down when there apparently wasn't enough market for the kits offered. Ken Adams' primary effort was a machine shop, and with the Ken-Hi closing, one could assume that Hi Johnson stayed with him to form Dynamic Models.

Dynamic Models early ad from Model Airplane News.

Studying the illustrations, let's look at the engine first. Obviously, it was a further development of a design that Hi had been associated with at Veco. What's interesting is the innovations—far ahead of their time and basic to our modern engines. A "domed piston" included a bypass port to increase fuel flow, and a much larger-diameter crankshaft allowed easy passage for all the fuel. The shaft was supported by a ball bearing, which only racing engines incorporated at the time. Also, for additional power, there was a crankcase pressure tap for a pressurized fuel system and a means to enlarge the intake venturi, which provided the additional power. I really don't understand why this engine wasn't extremely popular; I *do* know that my experience with one in an L.W. Pursuit was outstanding.

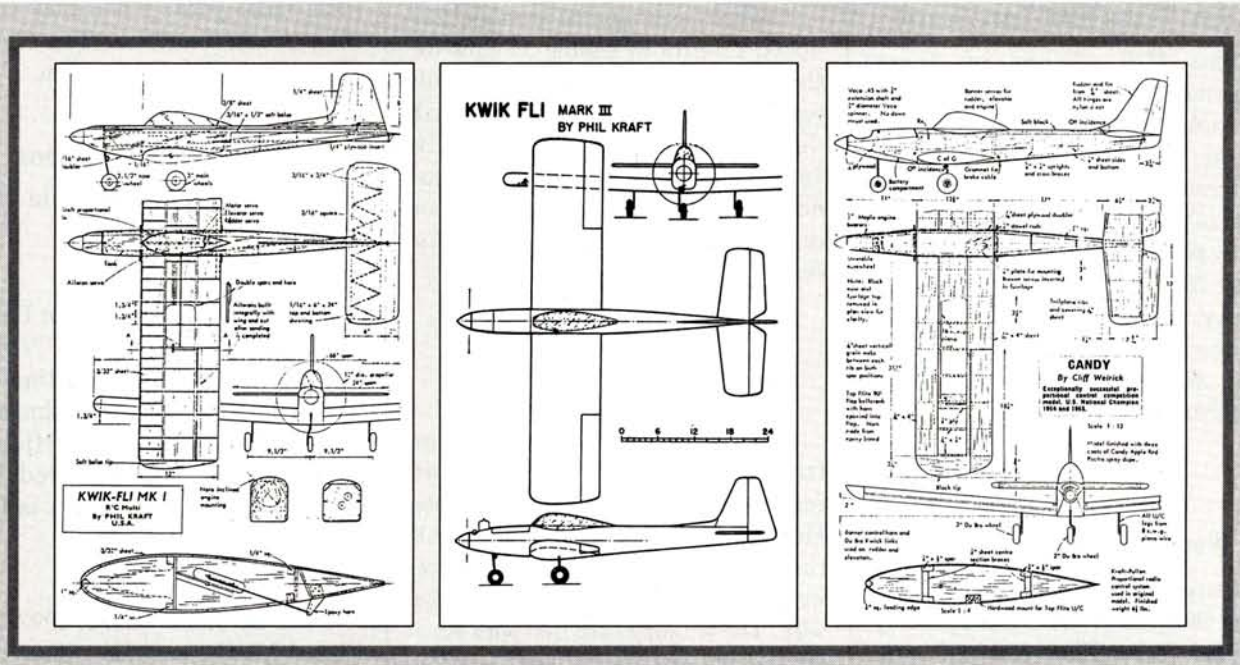
Combined with the engine was the "auto" carburetor. Before this innovation, others had adapted the rotary-barrel-style carbs. With their development, it was necessary to provide a mixture change for reliable low-speed operation. The change had been accomplished by introducing more air as the carb approached the low-speed position. This was a "fixed" feature—no adjustment. The auto-mix carburetor was the first to vary fuel flow instead of air. To accomplish this, it used the first horizontal-sliding-and-rotating barrel—the same one that modern carbs use. Hi Johnson had the forerunner of today's fine carburetors.

The "auto-pitch" propeller was another innovation that could compare with full-scale constant-speed props. With a fixed-pitch propeller, we are forced to compromise prop efficiency. The ideal pitch for level flight proves too great for maneuvers, so we have to use less than optimum pitch to prevent the engine from loading up.

With the Dynamic Models auto-pitch propeller, the idea was to set the adjustable pitch at the ideal angle for level flight. When the engine loaded up in maneuvers, the rpm decrease would allow the prop to assume a lower pitch, which, in turn, would reduce the load on the engine. This would enable the engine to operate at a constant rpm throughout the flight. Centrifugal force operating against pre-loaded springs mounted in the prop hub was the method used. The pitch would reduce to zero at low engine speeds, so, theoretically, it wasn't necessary for the engine to idle as slowly as it would have to with a fixed pitch prop. The auto pitch sure seemed to have potential!

An excellent action shot from the '64 Dallas Nats. Big Ed Kazmirski readies his Taurus for another winning flight. Photo courtesy of John Worth.

Perhaps my experience with this prop would best provide a reason why it wasn't widely accepted. As many were, I was excited about the possibilities of the auto pitch, and I hurried to the flying field with one attached to a .35-powered Viscount. For the first flight, the pitch was 6 inches—normal for a fixed-pitch propeller.



MORE POTENT SPA STYLE DESIGNS

Beyond the multitude of cabin-type trainers that you see at the flying field these days, probably the most popular planes are the so-called sport low wings. These have most of the attributes of sophisticated pattern competition machines without the complexity. If we would consider these designs for the SPA (Senior Pattern Association) competition maneuver schedules, we would find them to fill the need for competition neatly. Their greatest asset is simplicity, followed by aerobatic capability. Isn't that what the average flier desires? Good performance with the least effort.

Are there any SPA-eligible designs of a similar nature? Yes, many, including the following designs. In the early '60s, Phil Kraft entered the contest scene seriously and, as many of us did, he used his own designs. His name for the series always included the word "Fli," as in "Bar Fli," "Bi Fli," etc., and, most notable, the "Kwik Fli" series. Flying these, he won national championships and became world champ in '67. Their greatest asset was simplicity and ease of flight; you didn't have to be a "master stick twiddler" to accomplish 10-point maneuvers with them. The first was flown with reed equipment, which required hands-off stability; with the arrival of propo, Phil simply developed the design further. Note that the structure is very similar to the modern sport low wings—a cinch for scratch-building. Also, note the use of a big, thick airfoil similar to the one Kazmirski had popularized with his Taurus. Kwik Flis were very prominent on '60s flight lines.

Have you ever noticed how designers follow an "area trend"? Designs from the West will be similar; those from the Midwest will be similar to them but have a different look; those from the East may be on an entirely different track. Could this be the "sheep syndrome"? A case in point (and another with western influence) is Cliff Weirick's '64 and '65 Nats Champ, "Candy," which was so named for its candy-apple red color. You had to look closely on a flight line to distinguish a Candy from a Kwik Fli if they were the same color.

So if you have any SPA aspirations, here are two possibilities that are similar to what you may be currently flying; take your choice!

The performance was no different than that of other props. For the second flight, I increased the pitch to 8 inches and the Viscount really came alive in level flight; the rpm also stayed up in maneuvers, and the pull through them was very neat. Obviously, the auto pitch was operating as claimed. A couple of flights later, its shortcoming was disastrously demonstrated. The plane was on a landing approach that appeared to be high so, following custom, power was reduced to steepen the glide angle. Then came the surprise: when the rpm dropped, the Viscount came to an abrupt halt and quickly fell to the ground! You can imagine the result. The prop was designed to go into flat pitch below 6,000rpm. I had simply reduced the power below that, and in flat pitch, at those rpm, the prop-disk area presented a very effective air brake! Apparently, on previous flights, I hadn't had to lower the rpm below the critical point. With this potential, flying that prop would be like flying with a loaded gun!

Frank Madl reported a similar finding with the auto pitch, only he came out of it smelling like a rose. After a number of flights, he cut the rpm back and his model fell also; the only difference was that he

had altitude enough to recover. He says that he sold the prop the next day!

Naturally, I dropped Hi Johnson a line explaining the problem. The reply was that they had never experienced the problem, but that they understood it. Apparently the development had been done with C/L models only. Additionally, he stated that along the way they had attempted to lower the rpm at which the pitch went flat, but in doing that, they lost the variable-pitch feature at high rpm. The mechanism simply wouldn't allow both features. Sometimes, you can't have your cake and eat it too!

Hindsight tells us that constant-speed props are a distinct asset. With modern technology, do you suppose a problem-free auto pitch prop is possible?

In other matters, our past discussion of EK Products (Logictrol) continues to attract input about positive experiences with the equipment.

Major M.J. Mahon of Ft. Leonard Wood, MO, informs us that, after retiring from the Air Force, he has taken up modeling again. A C/Ler 20 years ago, he was switching from lines to R/C and bought a Logictrol. Unfortunately for R/C, a duty change ruled out modeling, so the Logictrol was stored. After all that hiatus, he plans to use the system for the first time.

More input from Arthur Perry of Berlin, MD, tells us he is still flying his Logictrol Champion, which has never failed him. Better yet, he cleared up something for me. Some of you had asked what happened to Logictrol when Bob Elliott closed the doors. Art tells us that an operation called "Full Command Systems" (908 E. Rosewood, Spokane, WA 99208) took over the EK operation and continued to offer its products. Not widely publicized, the FCS catalogue offered other very innovative products beside the Logictrol goodies. Art indicates that his dealings with them in the early '80s were fine. I believe I found the same. The question now could be: does Full Command Systems still exist? Give them a try and see what happens.

And so it goes. We still have a lot of catching up to do next time! ■

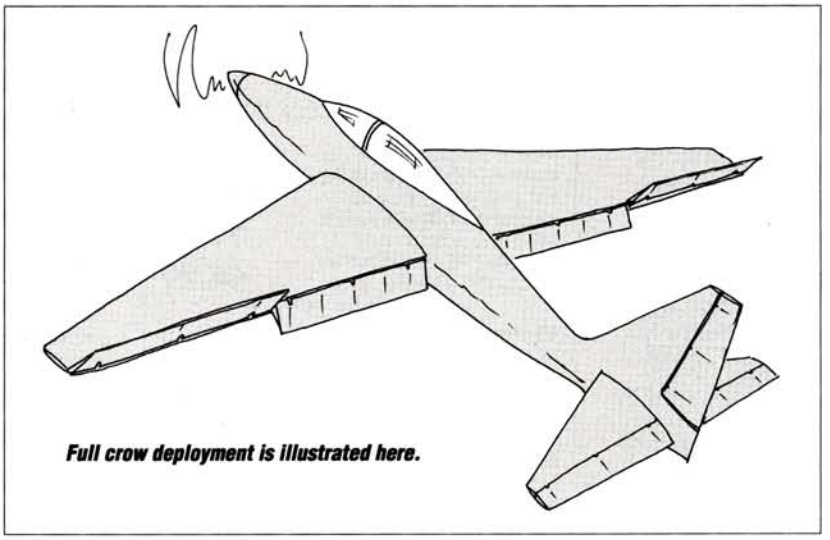
SIMPLE PROGRAMMING

DAVID C. BARON

PCM VS. FM; CROW; BATTERY EXTENSIONS

THIS MONTH, I will be answering a few readers' questions relating to JR* and Futaba* programmable radios. If you have any questions about how to use your programmable radio, whatever its brand, please send them in. This column is intended to help you, and I will periodically devote space to questions and answers relating to all the major brand radios. In this month's column, topics include:

- PCM vs. FM—current drain and fail-safe pros and cons.
- 1024-bit or 512-bit radios—what's the difference and why?
- Setting up crow mixing on the Futaba 7UAF.
- Programming to reduce rolling tendency during knife-edge.
- Tips for a better battery pack extension.



Full crow deployment is illustrated here.

CHOOSING A RADIO—PCM OR PPM?

I'm interested in buying a computer radio and have been looking at the JR X-347 and the Futaba 7UAPS. Which should I buy? Are they equal in quality? Which instructions are the easiest to follow? I do some competition, and the rest of the time just work on improving my flying.

I want to be able to change frequencies as well. Is PCM worth the extra money over PPM (FM)? I know both radios are PCM/PPM selectable. Thanks for your help.

CALVIN SWANK, Newton, IA

Calvin, you should choose your next radio based on the radios that you currently own. If you already have Futaba or JR gear, then the servos, switch harnesses and possibly even the receivers (whether FM or PCM) will be compatible.

As to choice of radio, each has unique features that a given modeler may prefer but, overall, they are fairly equivalent in programming capability. You will do well with either brand. In my opinion, the X-347 has a slight edge in overall flexibility, but the Futaba's trim-memory function is a very valuable asset, and it is missing from the X-347. The X-347 manual offers a little more depth on how to program and why. Although some newcomers have been worried by the size of the manual, don't be. It has three sections (with a good deal of redundancy) that separately cover power, glider and heli aircraft.

PCM vs. FM. *Whether PCM is superior to PPM (I will refer to PPM as FM hereafter) is sometimes controversial. PCM offers 1024-bit control capability (I use PCM receivers on many of my competition models), whereas FM typically allows only 512-bit control. The number of bits translates to how many increments of motion the servo sees from one extreme of throw to the other. FM radios offer only half (512 bits) of these steps or increments.*

In pattern, the top fliers feel that 1024 is indispensable. You can feel the difference in how smoothly the plane performs. On fun-fly designs that have oversize surfaces and outrageous throws, you can actually see the steps in a 512 radio (whereas you can't in a 1024 radio).

On the other side of the coin, some of the after-market FM receivers, (these cost less than original-manufacturer FM or PCM receivers) are spectacular values when you are expanding your airborne capability. I do use these receivers (e.g., RCD), and I'm impressed with their ability to operate in high-noise environments (e.g., high-voltage electric aircraft).*

Few owners of FM programmable radios realize that they usually have the capability to transmit on PCM, even though the front of the transmitter says FM. Internally, these transmitters are typically identical to their PCM-labeled counterparts. Look in the programming functions for a "Fail Safe" system. If you find that, your manual will tell you how to switch to PCM.

Fail Safe. *A primary reason for PCM is the fail-safe function. Before*

you decide whether you need a fail-safe function, look at your flying style carefully. When a fail-safe kicks in, the control surfaces and throttle on your airplane move to pre-programmed settings. There are two schools of thought on setting this up. First, if your airplane is extremely stable, you could program it for free-flight, say with a gentle turn with little or no power. Most pilots choose to program in low idle so that it is obvious when the fail-safe engages. If the interference passes, the engine will still be running when the signal resumes.

However, if you own a pylon racer, helicopter or any craft that spends a lot of time down close to the deck, there is no safe preset for the fail-safe. A logical preset would be to kill the throttle but, in reality, this may only give you notice that it's time to get the dustpan out of the car. DCB

CROW MIXING; PCM CURRENT DRAIN

I own a FP-7UAP 1992 Futaba. At the moment, I fly R/C gliders full house. I purchased this radio to get aileron differential the quick way but now see endless possibilities. My question is how do I program Crow? I'm using two servos for ailerons and one for flaps. I'd like to use two here if I knew how.

I've read that PCM's use a lot of battery. At which end—Rx or Tx? Is this a problem, and what's best way to overcome it?

KARL JOSCH, Pickering, Ont., Canada

Karl, crow mixing with the 7UAP requires using the aileron differential (DIFF) function, two servos for your ailerons/spoilers, and only one servo for flaps (or two servos on a Y harness). To set up, plug the flaps directly into the throttle position on the receiver. Then slave the spoiler/ailerons to move in opposition to your flaps by using the PMX-1 and the PMX-2 functions. On PMX-1, set channel 3 as "master" and channel 1 as "slave." Next, set PMX-2 to mix channel 3 (master) and channel 7 (slave). You'll probably need to change the direction of travel for each and zero out any downward travel of the spoilers so that they are not trying to travel down when you are in the normal (full-throttle) position.

The 7UAP does not have an automatic elevator trim, so you'll need to experiment with different amounts of flap throw and spoiler throw to keep your model from pitching up or down when you deploy the crow. In the newer Futaba 7UAPS, the trim-compensation problem is solved by the new air brake function (ARBK).

Power Consumption. *To answer the question regarding power consumption, I enlisted the help of Model Airplane News contributor and electronics technician Mike Mayes. He and I found that the receivers of all the major brands of radios all draw similar amounts of current, whether FM, PCM or AM (ACE). All of the radios drew from 16mA to 30mA with one servo plugged in (and resting at idle) and the transmitter on.*

With respect to transmitters, however, PCM drew more current than FM. The difference was approximately 30 to 40mA, which is equivalent to 10.5 minutes if the average duration of a transmitter is 2.5 hours. Interestingly, how you hold your transmitter when you measure the current draw makes a greater difference than the mode of transmission. If you hold the antenna vertically rather than horizontally, it can draw an additional 50mA. All of our measurements are approximate, and I'm sure that someone out there will dispute these findings to some degree. Although I feel that I can confidently say that your transmitter will draw more current in a PCM than in an FM mode, in reality the difference is trivial. DCB

FIXING RUDDER INDUCED ROLLS; BATTERY EXTENSION

I have a 7UAPS that I have purchased secondhand, without instructions. I am using a conventional setup with two servos for ailerons in a CGM Extra 300. I am already using the flaperons function. How do I set-up a mix of 4 degrees of negative aileron to be coupled with rudder deflection when flying knife-edge? How do I make my rolls more axial?—with aileron-rudder mixing or with differential ailerons?

Also, do you recommend putting an extension on the battery pack to facilitate moving the pack toward the tail to improve the CG? Can this extension cause interference or power loss?

DELVIN PEARCE, Rochester, MN

Delvin, it sounds as if your Extra 300 rolls slightly when rudder deflection is

(Continued on page 74)

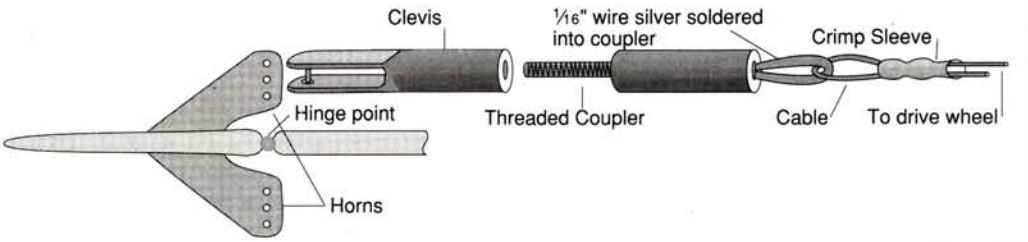
HOW TO

Pull-Pull Systems for LARGER MODELS

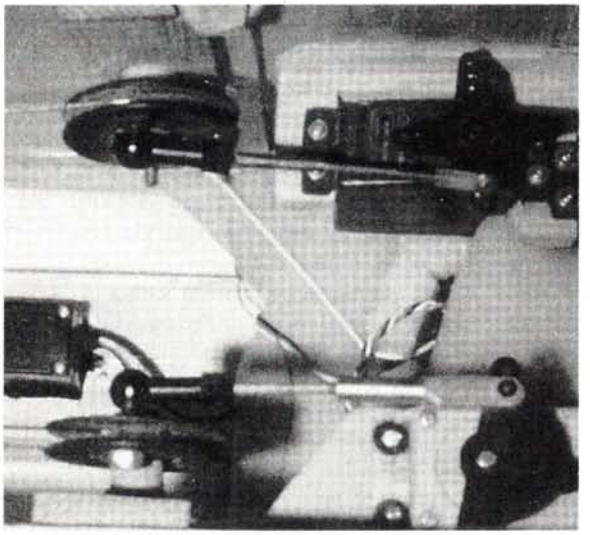
Make your own mechanics

by RODNEY D. IWAN

Figure 1 Clevis-Coupler-Cable Connections



THERE ARE several advantages to using a pull-pull control system: it closely simulates full-scale practices, and the control cables can be routed where pushrods cannot. It usually results in a lighter system, which saves weight in the aft section where it's most important. A pull-pull system minimizes damage during a hard landing or other mishap, and it's also more reliable in large model aircraft as there are no effects from pushrod bending or vibration.



Note the servo linkages between the pulleys and the servo output horns. The pulleys eliminate tension/slack problems that arise when the geometry of the output arms does not exactly correspond with that of the control-surface horns. After seven years, this system is still working perfectly on a 13-pound model.

I'm sure you'll find other advantages if you start using a pull-pull system. For instance, it's difficult to disguise a pushrod in a scale ship, but pull-pull cables can be very scale-like. (Note: there are also disadvantages to such a system. Sloppy workmanship cannot be tolerated. Unless you're willing to pay particular attention to a few basic rules, you're better off sticking with the conventional pushrods.) Let's look at the basic requirements.

CONTROL HORNS

Obviously, two horns are needed on each movable surface. The attachment point for each cable must be the same distance from the hinge point. The two attachment points on the movable surface must be in line with or slightly aft of a line passing through the hinge point. If these cable attachment points are in front of the line through the hinge point, the cable not being pulled on will tighten as control is moved from neutral. This will quickly increase the force required for control to the point where the servo is overloaded or stalled. If the attachment point falls aft of the line passing through the hinge point, the line not being pulled becomes slack, which is no problem unless the slack becomes so excessive that the cable can jump off a guide or a pulley. You can buy the horns or make your own. For large models, I usually make my own from aluminum T-stock that's used in interior wall construction.

CABLE-DRIVE MECHANISM

Most builders start out trying to use a bellcrank or a similar drive mechanism at the servo end. If you do that, you immediately saddle yourself with three unnecessary demands:

- The length of the cable-attachment points from the pivot point on the bellcrank must be identical to the length of the control-horn attachment points from the hinge point at the movable surface.
- The relative angles of the bellcrank and of the horns must be identical.
- The attachment points of the cables to the bellcrank must be on or ahead of a line through the pivot point of the bellcrank—just the opposite of what you needed at the horns.

If you use a circular drive wheel at the servo end of the cables, these problems disappear. As the drive wheel rotates, it always plays out as much cable as it

reels in. With a circular drive wheel, major differences in horn length and drive-wheel radius can exist with no binding.

CABLE CHOICE AND TERMINATIONS

Monofilament fishing leader and nylon-covered, stranded-steel fishing leader work well for cable. I've used line that's rated from 20 pounds to 80 pounds. My experience with cable, however, has been in warm areas, i.e., Southern California and Florida, so if you live in colder climates, keep in mind that the cold can make monofilament brittle. For my ¼-scale, 17-pound, J-3 Cub, I used 80-pound-test monofilament on all surfaces (including ailerons). It has lasted more than a year with no problems. The 60-pound-test, nylon-covered stranded-steel line that I used on a 13-pound mid-wing design has lasted for more than seven years with no sign of trouble. After one year, I did take the monofilament elevator control lines out of the Cub, and I examined the crimp connections under a magnifying glass to see if I could detect any signs of stretch or necking down. I didn't find any, nor could I break the lines with my hands.

The weakest link in pull-pull installations is usually the way the ends of the cable are terminated. Don't let the cable rub against any sharp edges; this includes the eyelets at the control horns. The most foolproof and the easiest way to ensure a smooth fit is to use Du-Bro* or Goldberg* threaded couplers with a loop of 1/32-inch piano wire silver-soldered into the end to attach the cable. (see Figure 1). You could also use Du-Bro's 2-56 threaded rigging couplers, providing you eliminate any burrs or sharp edges in the hole that the flex cable passes through. You could then use a threaded clevis to the control horn, which makes tension and throw adjustments easy. The 1/32-inch piano-wire loop has a smooth surface through which to thread the cable. If you use anything with a hole drilled through it, be sure to smooth and polish the edge of the hole so that it won't wear through the cable.

When you purchase the cable material, also get crimping sleeves that are the right size. Slip a sleeve over the cable, run the cable through the piano-wire loop and back through the sleeve and the crimp. Be careful! Don't just smash the sleeve down with a pair of pliers. Use a crimping tool, if you have one, or, if you're very careful, use a pair of dykes (wire-cutting pliers) and gently squeeze the sleeve closed near both ends (a double crimp). Don't squeeze so hard that

MAKING A DRIVE WHEEL

The drive wheel, hereafter referred to as the pulley, is probably the most difficult component to make. One method is to make a pulley out of wood. (Of course, if you have a lathe, you can make your pulley from a variety of materials, e.g., Bakelite or suitable plastics.) Make two disks about 1.5 inches in diameter out of either 1/64- or 1/16-inch plywood. Make a third disk that's ¼ inch less in diameter out of 1/8-inch plywood (don't use lite ply; you need a firm wood), and sandwich it between the two larger disks. Use one of the instant glues and saturate the exposed edge of the inner disk to further harden it. This gives you a pulley with a 1/8-inch lip on each edge. To reinforce the center section, glue a ¼-inch-thick, 1-inch-diameter disk to each side. If you used a hole saw to make these plywood disks, you probably have a ¼-inch hole through the pulley at its center. If so, to reinforce the center section, glue in a section of ¼-inch dowel that's ¾ inch long (to plug the hole). The bearing surface is relatively wide to prevent the drive wheel from wobbling on the bearing.

After the glue has dried, drill a 7/32-inch-diameter hole through the center of the pulley, and epoxy a ¾-inch-long section of 7/32-inch-o.d. brass tube into it to act as a bearing. Refer to Figure 2, and drill the hole to attach a ball link and the two 1/16-inch holes to hold the cable to the pulley. Note that the two 1/16-inch holes go through only one side of the pulley and exit at the exposed surface of the inner disk. Now cut a section of brass tube that's slightly more than ¾ inch long from a 3/16-inch-o.d. piece of brass tube (a slip-fit into the 7/32-inch-o.d. tube). This will be the inner bearing. Mount the ball link onto the pulley. There are several choices of ball links on the market. I find that the Du-Bro* Swivel Ball Links are the most versatile; they're available in 2-56, 4-40 or metric sizes, and you can substitute longer bolts if required. By varying the distance from the axle to the ball link, you can control the amount of cable travel versus servo throw. To minimize cable play, mount the ball link as far out as possible.

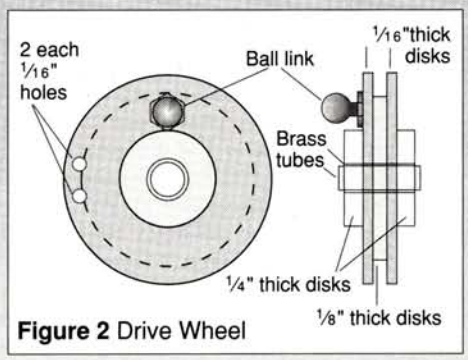
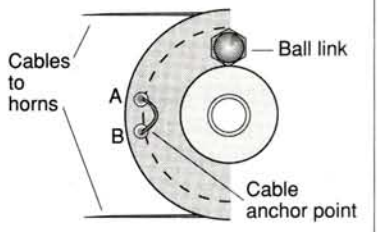


Figure 2 Drive Wheel

Put a 6-32 bolt through the fuselage side, slip on a no. 6 washer, the 3/16-inch-diameter brass tube (with the pulley already on it), another no. 6 washer and a locknut. When you tighten the locknut, the 3/16-inch o.d. tube should be clamped tight, but the pulley should still turn freely on it. If it doesn't, the 3/16-inch tube is too short, and you'll have to replace it with a longer one. (See Figure 3) Make sure that there's no play in the pulley axle and that it's friction-free. You don't want the pulley to wobble or to be off center.

Figure 3 Cable Attachement



Pull half the length of the cable through hole A and half through hole B. Wrap one end 270 degrees clockwise around the pulley, and thread and attach the cable as noted in the text. Then anchor the cable with a small drop of CA in holes A and B.

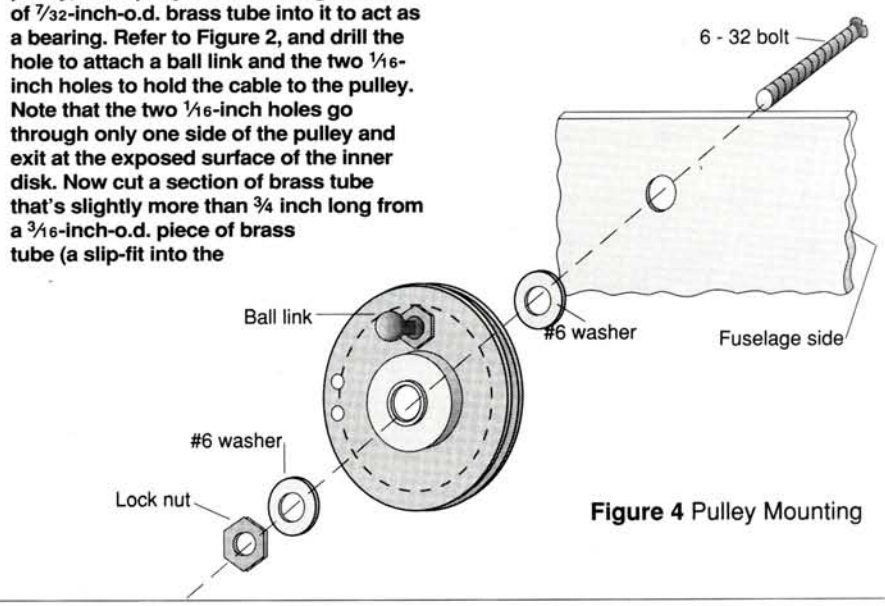


Figure 4 Pulley Mounting

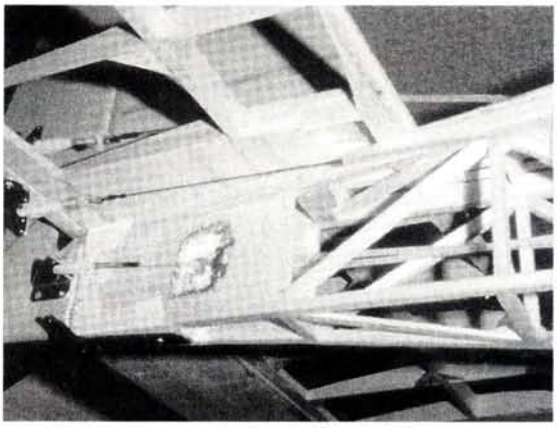
you put a sharp "vee" into the sleeve or fracture it; just squeeze enough to capture the cable solidly. Practice this technique.

Cable exits to control horns can be seen at the aft end of this ¼-scale J3-Cub.

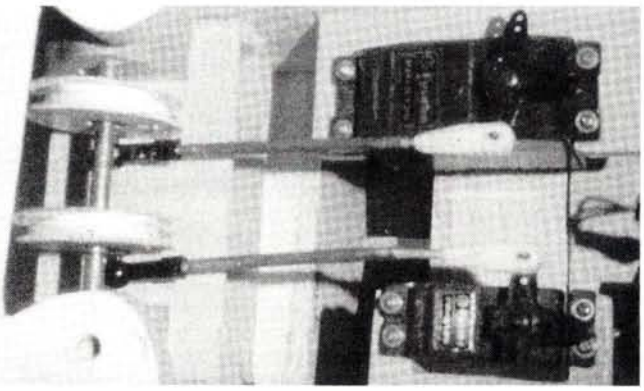
CABLE GUIDES

If you have a straight run from the drive wheel to the horns, a guide isn't needed, but it's still desirable in case you ever want to replace the cable. The best material I've found for cable guides is the small-diameter nylon tubing that's available at automotive stores or specialty shops. Hobby Lobby* sells a package that contains 25 feet of nylon-tube pushrod, which gives you 50 feet of tubing (one size telescopes into the other). You can route the tubing around any smooth curve with no problems. Support it frequently to prevent it from vibrating. Align one end of the guide with the control horn and the other end with the cable drive wheel. If you have to make any abrupt changes in direction, use a small pulley like the one Proctor* makes, or fabricate your own. To prevent the cable from jumping off the track under adverse conditions, end the cable guides as close to the pulley as possible. Before you thread the cable, make sure the drive wheel is smooth.

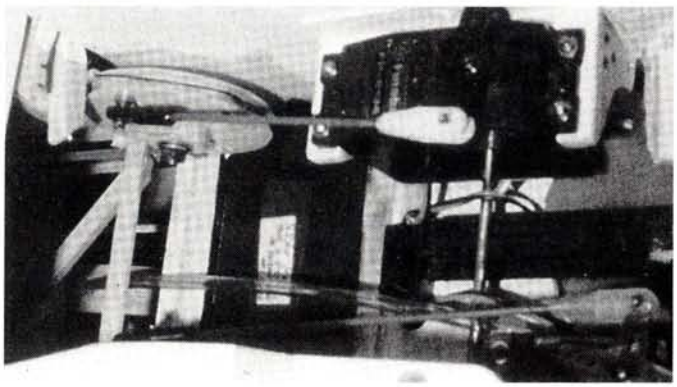
Start the threading operation by cutting off a piece of cable twice as long as the distance between the pulley and horns, plus about 18 inches. Feed one end of the cable through hole A (see Figure 3) and the other end through hole B. Pull the cable through the holes until half of it exits each hole. Wrap one end 270 degrees clockwise around the pulley and thread it through the upper guide to the upper horn. Refer back to Figure 1, and attach the ends of the cable to the horns. When you're sure that the surfaces are in neutral when the ball link is properly positioned relative to the servo, crimp the cable ends. To anchor the cable in position, put a drop of instant glue in the two 1/16-inch holes in the pulley. Always use the minimum cable tension. It's surprising how solid the control response is with relatively slack cables.



On this 6-foot, Quadra-powered biplane, nylon guide tubes facilitate the re-stringing of cables, if there's ever a need.



In this Lazy Ace installation, 4-40 hardware, large Du-Bro ball joints and a monster clevis are used to connect the servos and the pulleys. Note the short brass tube pushrods with 4-40 bolts silver-soldered into their ends.



This servo-to-drive-wheel linkage is used on a large biplane. It uses 4-40 hardware and a monster clevis.

SERVO CONNECTIONS

The servo should be mounted as close to the drive wheel as is practical. Use a short, stiff pushrod between the ball link on the cable drive wheel and the servo. On the ¼-scale ships, I try to use 4-40 hardware for all ball links and pushrods. On the smaller craft, the 2-56 hardware is adequate. Whatever you do, don't try to use the servo wheel itself for a drive wheel. You might get by for a while, but you'll soon have a servo-bearing failure on the output shaft. You can cheat on the really small craft but not on the 40-size and up.

GENERAL NOTES

Periodically inspect your installation. Check for "crimp integrity" and for abrasion of the cable at guide inlet/exit locations. Make sure that the servo mounts and bearing mounts remain firm, yet free of friction. Nothing kills airborne batteries faster than binding or stiff controls. Don't be afraid to experiment; if you have a small lathe, make your own pulleys and clevises. In general, the larger you can make your control horns and drive wheels, the better the system will function. Try to keep the diameter of the drive wheel equal to the length between the cable attachment points on the horns, unless you specifically want to change the ratio of servo throw to horn throw.

**Here are the addresses of the companies mentioned in this article:*
***Du-Bro Products,** 480 Bonner Rd., Wauconda, IL 60084.*
***Carl Goldberg Models,** 4734 West Chicago Ave., Chicago, IL 60651.*
***Hobby Lobby International,** 5614 Franklin Pike Cir., Brentwood, TN 37027.*
***Proctor Enterprises,** 25450 N.E. Eilers Rd., Aurora, OR 97002.* ■

Tom Polapink did a beautiful job building his Pfalz D-IIIa. With a 74-inch wingspan and a weight of 12½ pounds, the model was powered by an O.S. 1.20, and it won 1st place in Precision Scale. It took nine months to build.

RHINEBECK AIR DI

26th

from vintage full scale to R/C

by FRANK GUDAITIS

APART FROM A fairly strong wind out of the north, the 26th Jamboree in Rhinebeck, NY, got off to a fine start on a clear-blue-sky Saturday. As in the preceding year, the Mid Hudson Radio Control Society opened this event to all categories of miniature R/C aircraft, not just WW I types.

There were 111 registered contestants. During these two days, a total of 589 scored flights were recorded by 39 judges. Of this total number of flights, 448 were in the mission category, 47 in freestyle, 23 in precision scale and 71 in sport scale. This amounted to something like 45 scored flights per hour! Fortunately, there weren't many crashes this year.

Above: this full-size 1911 Curtiss model D replica (with original engine) pusher flies often at the Rhinebeck Aerodrome and is a treat to see. The engine is an 80hp, liquid-cooled Hal-Scott V-8. Landing is at about 30mph, and it cruises at about 45. The airframe is built entirely of spruce and bamboo. The wing covering used currently is Dacron, but it was originally either cotton or muslin. The pilot sits with his shoulder snug in a cradle. By leaning right or left, he makes ailerons deflect left or right. A control wheel is used for rudder, and the wheel is pushed or pulled fore and aft for elevator. Throttle is controlled by foot pedal. This flight was piloted by John Barker. ■ *Below left: seeing this very rare, full-size 1913 Caudron G3 take to the air, you could almost smell the castor oil from its exhaust. Pilot Gene DeMarco looks over the 80hp LeRhone rotary engine. The engine has a redline of only 1,200rpm and produces a lot of torque. The airframe is made entirely of spruce. This plane cruises at 45mph and lands at about 25mph.* ■ *Below right: on a short hop, this full-size replica 1910 Hanriot monoplane demonstrates its open-air pilot accommodations. Pilot Bill King sits behind the 50hp Franklin—an engine from the mid-'30s. The plane was originally flown with a 35hp, in-line, liquid-cooled, 4-cylinder Eldridge engine, but its crankcase developed cracks and had to be retired. The Dacron-covered wings originally would have been covered with rubberized balloon fabric. The Hanriot has wing warping for lateral control. The mahogany plywood fuse looks like a racing skiff. (The Hanriot brothers specialized in racing skiffs, which influenced their airplane designs.)*

Above: this 1918 Pensuti-Caproni triplane was built by Eric Williams of Redford, MI. Powered by an O.S. 1.20 4-stroke engine, the 1/3-scale model weighs only 10 pounds. ■ Right: Tom Kosweski readies his large 1/3-scale Sopwith Pup, built from a Balsa USA kit. Tom placed 2nd in Sport Scale.

This full-size 1909 Bleriot model XI (serial number 56), piloted by Karl Erikson, took to the air in a re-creation of early aviation history. It has a 25hp, 3-cylinder Anzani engine that runs on regular 80-octane aviation fuel. Although flown at Rhinebeck with a 64x46-inch prop, the original prop was scimitar-shaped with a diameter of 84 inches. The fuselage is spruce and ash, and the wings are made of mahogany plywood and spruce. The wings, now covered with a Dacron fabric, were originally covered with Continental rubberized balloon fabric. There are no ailerons: lateral control is by wing warping. The plane has a cruise speed of 36mph (one pilot reported, "It feels like 100mph") and a landing speed of 28mph. To facilitate crosswind landings, the main gear has castors!

Don Peters and his French Caudron G-3 fighter. Don had the special treat of seeing a full-size Caudron fly at the Jamboree.

PHOTOS BY FRANK GUDAITIS

...OME Jamboree

x-may-67

Either an electronic malfunction or a mechanical failure caused Henry Haffke's beautiful 90-inch-wingspan Gee-Bee Model Y Senior sportster to meet with disaster during one flight. Strangely, this was not unlike the fate that so many of the full-size Gee-Bee airplanes encountered half a century ago.

ON CLASSIC WINGS

On a more cheerful note, almost all of the other superb large-scale models flew without any serious mishaps. Tom Polapink's German Pfalz D-IIIa 1/5-scale WW I fighter took 1st in the precision scale event. This very elegant scratch-built aircraft has a wingspan of 74 inches and weighs 12½ pounds. It's powered by an O.S. 120 4-stroke engine. Tom spent 9 months meticulously building this winner.

Second place in this event went to a very friendly visitor from Canada: Jean Chevalier, and his beautifully detailed red-and-white ¼-scale Ryan ST-A. One of the details included a "pilot" wearing a leather jacket with a fur collar—the work of Mrs. Chevalier. With a wingspan of 92 inches, this 20-pound miniature was powered by a Super Tigre 3K engine. A Futaba 7UAP 6-channel radio controlled all functions, including a smoke trail. Third place was awarded to Peter Jakab, one of the historians of the National Air & Space Museum. His 1/5-scale WW I German Fokker E III Eindecker featured wing warping and a full flying horizontal stabilizer.

One of the most extraordinary large-scale models that flew in the scale event was an Italian WW I triplane. This very rare and almost unknown 1918 Pensuti-Caproni aircraft was scratch-built by Eric Williams of Redford, MI. Eric had only three photos and very little data to work with. His 1/3-scale model has a wingspan of 52 inches and weighs only 10 pounds. An O.S. 120 4-stroke engine supplies the power.

The sport scale event was won by Bill Steffes and his very beautiful WW II 1/5-scale model. The full-size North American Aviation BT-14 was originally built in 1938. The model weighs 25 pounds, has a wingspan of 101 inches and is powered by a Quadra 50 engine.

Tom Kosweski and his 1/3-scale Sopwith Pup placed 2nd in this event. Nick Ziroli Sr. took 3rd with his twin-engine Beech D-18/C45. Nick's 1/5-scale, 37-pound miniature aircraft has a wingspan of 114 inches, retractable landing gear (including the tail wheel), functional wing flaps, and smoke generators behind both engines. Two synchronized Zenoah G-38 2-stroke engines power this plane, and an 8-channel Futaba PCM radio controls its flight. It was the only twin-engine airplane at this meet, and its flight demonstrations were very impressive.

One other unusual scale aircraft was a miniature copy of a French homebuilt—the Flying Flea. This ¼-scale model was built by Steve Dudzinski, who came all the way from Durham, NC.

Above: the big Ryan ST-A flew well and looked great trailing smoke. Center: Nick Ziroli's 1/5-scale, twin Beech D-18. Twin G-38 power, 114-inch wingspan, 38 pounds, flaps, retracts and smoke.

The freestyle event was won by Barry Couchman and his large-scale Sopwith Pup. Kevin Beacraft and his Stearman PT-17 took 2nd and Nick Ziroli Sr. placed 3rd with the twin Beech.

The winner of the incredible 448 scored flights in the mission category was Joe Melcharre, who flew a German WW I Rumpler Taube; Rolly Siemonsen placed 2nd and Kenneth Hall took 3rd. Almost all of these flights were made with stand-off-scale models of German WW I airplanes, e.g., Rumpler Taubes or Fokker Eindeckers.

HISTORY REMADE

The flying stopped around two in the afternoon so that Cole Palen and his loyal group of pilots could treat everyone to some flights of full-size early airplanes. These early birds are always a pleasure to watch, although on this day, their flights were restricted to brief hops because of the strong north wind. These vintage aircraft share a strong kinship with many of the models being built today—right down to materials and flight speeds.

One of these early aircraft was a French Caudron fighter. Watching this brief flight was contestant Don Peters, who brought a scale model of the Caudron to this Jamboree. It must have crossed his mind that perhaps nowhere else in the world could such a coincidence occur.

Bill Steffes's 1st-place 101-inch-wingspan BT-14 was adapted from Ziroli AT-6 plans. It's powered by a Quadra 50.

For more years than the total number of these R/C Jamborees, Cole Palen has kept alive the only flying museum of the very early days of aviation. He deserves our appreciation and respect for all his years of dedicated efforts. ■

Editor's note: For those who would like to visit the Rhinebeck Airdrome, air shows are put on every Saturday and Sunday, June 15 to October 15, at 2:30 p.m; (914) 758-8610.

Do You Really Know Balsa?

A visit to the source of this remarkable wood

by GUY REVEL

This wild balsa tree was photographed near the flying field of the famous Costa Rican model club, Aeromodelismo Costa Rica, where the annual Tropical Fun-Fly is held. Inset, top: At eight months, the hand-cultivated balsa trunk is already big. Leaves are cut with a machete so that the stem grows straight. Inset, center: Balsa fruits in various stages of maturation. Once ripe, they're covered and filled with a fur-like stuff, and they explode at the slightest shock, disseminating the seeds. Below: the bark is stripped from the wood as soon as it arrives at the mill.

PHOTOS BY GUY REVEL

WHAT WOULD modeling be without balsa? It is the fundamental product; without it, model airplanes never would have been so popular. Balsa is as necessary today as it ever was, and all the high-tech space-age materials used for specific modeling applications will never replace this fabulous wood and its many unique properties.

Every modeler learns from the start what processed balsa looks like. But balsa *trees* grow in the tropical rain forest where very few modelers ever go. Although balsa trees grow in many countries, in only a few of these does the

wood have the necessary properties for our special use. The largest part of the model-quality balsa comes from Ecuador. Smaller quantities of high-quality wood are also produced at the Balsatica plant in Costa Rica, which I visited.

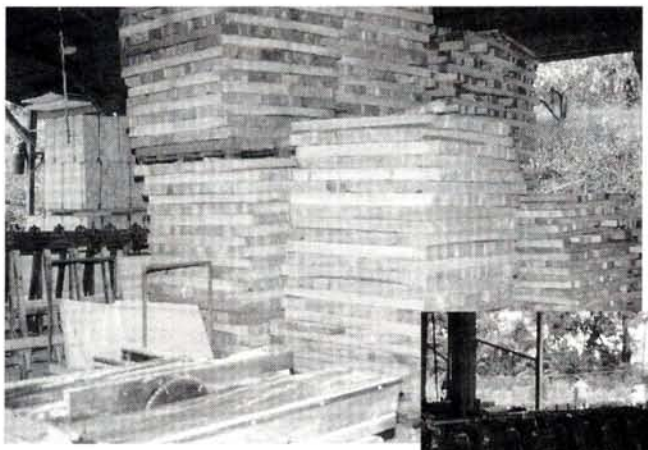
Costa Rica is a small Central American republic that spans between the Pacific and the Atlantic Oceans. Its northern border is Nicaragua and the southern border is Panama.

Heinrich Meister, president of Balsatica, shows a balsa plant that's a few weeks old. Its leaves are already enormous.

GOING TO A BALSA PLANTATION

Although wild balsa trees grow throughout the country, useable wood comes only from trees growing at altitudes of 150 to 750 feet. On the mountain, the wood—although still quite light compared with other species—is too heavy for most uses. At sea level, it is much too soft to provide any resistance. According to specialists, the very best balsa grows in southern Costa Rica, near the Panamanian border. Unfortunately, the lack of roads prevents any industrial activity in this very wild and undeveloped region.

While other participants in the famous Tropical Fun Fly—which was the other reason for my coming to Costa Rica—were on the flying field practicing for the big Sunday event, I went to Siquirres, a small town near the Atlantic coast. After a three-hour drive up a central mountain, then down into the tropical rain forest, and after crossing coffee, cocoa, tobacco and banana plantations, I finally arrived at the Balsatica plant, in the huge banana region. This is not by accident: balsa trees, like banana trees, need very rich soil and do not grow just anywhere.



These logs will fill the kiln, and then be heated and dried for about two weeks.

A BALSA PLANT IN TROPICAL NATURE

Balsatica is the only balsa producer in Costa Rica. Looking at its customers' list is similar to looking at a listing of countries. This company is headed by Heinrich Meister, a Swiss forest engineer who settled in Costa Rica 20 years ago, and his partner Ron Echandi, a modeler who owns the big balsa plantation and a sawmill where the wood is processed.

Like most wood mills—particularly in tropical regions—the vast balsa mill is "open-sided" amid lush vegetation where only cacao trees have been planted. Timber arriving from the plantation is processed there. After stripping the bark off the wood with the same machete that's used when walking through the forest, the logs are band-sawn, and the remains are then used for heating the kiln in which the balsa lumber is dried. Raw wood contains a lot of water and can't be used until it's dry. This drying process lasts for a minimum of 10 days, but more often, it's two weeks before the balsa is dry.

At this point, the balsa logs are selected according to their density. At Balsatica, 20 to 25 percent of the wood is of the proper quality (the best) for modeling. In other plantations, depending on the climate and growing conditions, it may be only 5 to 10 percent. The rest is used for many other applications. Among these are aircraft floor panels, where vertical-grain balsa is sandwiched between aluminum sheets, as aboard B-747s, and liquid gas tank lining aboard tanker ships. Four thousand cubic feet of balsa are needed to make only one of these enormous tanks in which compressed gas—usually methane—is kept.

Costa Rican balsa is noted not only for its quality, but also for its color: it is so white that it looks almost as if it has been bleached. The dry lumber is sent to the nearby port of Limon, on the Atlantic coast, where it is shipped to Europe and the U.S. However, an increasing amount of balsa is processed at Siquirres and made into planks before being shipped.

As you noticed, I've made no mention, so far, of how the wood is grown. Let's go to the balsa plantation.

Above: the fresh wood is first band-sawn into smaller rectangular logs.

Left: finished logs are glued for making end-grain filling stuff for aircraft and boat floor panels.

IN THE FOREST

Most of you have never seen a balsa tree. It is, however, quite recognizable. It has white bark, large leaves and large white-haired fruits, which—when ripe—explode under the slightest shock and release a dense cloud of what was once known as kapok and used as a filling for pillows. Wild trees have huge spans and are often low to the ground, with a number of large branches. Sometimes, in the forest, you can see the seeds floating down as white snow-like fluff when the wind blows even slightly.

(Continued on page 98)

CENTER ON LIFT

(Continued from page 26)

Simons, Ferdi Gale and Hewitt Phillips. Because there was such a long delay, a few of the papers were written some time ago. Soar Tech editor Herk Stokely promises to get the next issues out fairly rapidly since he has retired (now he can do really important work).

That's it for this month. If you would like to see some specific soaring subjects covered in this column, don't forget to send me a letter c/o "Center on Lift," Air Age Publishing, 251 Danbury Rd., Wilton, CT 06897. See you next month.

**Here are the addresses that are pertinent to this article:*
***Carl Goldberg Models**, 4734 W. Chicago Ave., Chicago, IL 60651.*
***PlastiZap**; distributed by House of Balsa Inc., 10101 Yucca Rd., Adelanto, CA 92301.*
***Terry Luckenbach**, 5460 Colony Dr., Bethlehem, PA 18017; (215) 262-5226.*
***Soar Tech**, c/o H. A. Stokely, 1504 N. Horeshoe Cir., Virginia Beach, VA 23451.* ■

PROGRAMMING

(Continued from page 59)

increased. To correct this problem, use either your PMX-1 or PMX-2 mix. Make channel 4 (rudder) the master and channel 1 (aileron) the slave.

The amount of mix will vary depending on the plane, so start out conservatively with only minor deflection of the ailerons. To get it exactly right, you will need to fly it and make some adjustments at the flying field based on its performance in the air. To facilitate making quick changes when I land, I like to leave the display screen open to the function that I am manipulating.

Axial rolls. *The flaperons mix (FLPR) you are using is capable of performing the additional task of handling differential, but if you are using the flap coupling in flight, that coupling can impair your ability to achieve axial rolls. It is not easy to keep the little flap knob in a reliable, properly "trimmed" neutral position since it does not have a positive center. I would inhibit the FLPR and turn on the aileron differential (DIFF) function. Because the DIFF mix uses ports 1 and 7, and FLPR uses ports 1 and 6, they cannot be used together. If you try to use them both at the same time, the radio will only recognize the last one that was turned on.*

First define the problem. Measure both directions of deflection of each aileron. I use a paper protractor template taped into the gap between the aileron and the wing. The trailing edge of the aileron is the pointer. If there is more throw down than up (or vice versa) in either or both of the ailerons, this may be the problem. This is not to suggest that equal throws all around will result in an axial roll, but it makes an excellent place to start.

If you cannot account for a large difference in throw between the two ailerons, double-check your ATV function (adjustable travel volume), to make sure

(Continued on page 94)

by DAVID GIERKE

ENGINE REVIEW

Real Performance Measurement

Featuring In-Flight Testing

ENYA .60XF-4 G8 RING

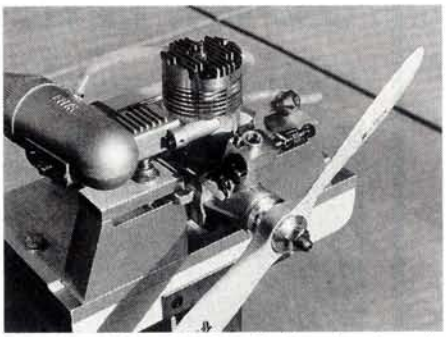
WHEN THE PACKAGE arrived in early September, I thought "Aha, another early Christmas present from my friends at Model Airplane News." As I carefully opened the wrapping paper, the emerging red-and-yellow box appeared to announce: "Your powerful new Enya* pattern engine is here, ready to deliver 2hp from a mere 6/10 cubic inch!" But wait a minute; what the heck is a .60XF-4 G8 ring? After a brief look at the beautiful matte finish on the case and front housing, vividly contrasting with the shine of perfectly machined aluminum parts, I opened the instruction manual to see what I had.

Enya lists 35 engines that it manufactures, and our .60 isn't intended for FAI aerobatic planes, but for sport and scale planes. After the initial letdown of finding that I wouldn't be testing a fire-snorting piped pattern engine, I decided to investigate just what the difference was between our "sport" engine and the .60XF-4 aluminum-chrome, the GP .60XF-4 aluminum-chrome and the GP .60 XLF-4 aluminum-chrome—all intended for high-performance aerobatic aircraft.

Most obvious was the difference between the piston and cylinder liner combinations. Our test engine uses an aluminum, single-ring piston that reciprocates in a hardened-(unplated) steel liner. The other three use the AAC combination that has a high-silicon aluminum-alloy piston running in a low-expansion, aluminum-alloy, hard-chromed cylinder liner—the latest thing in high-performance 2-stroke engines.

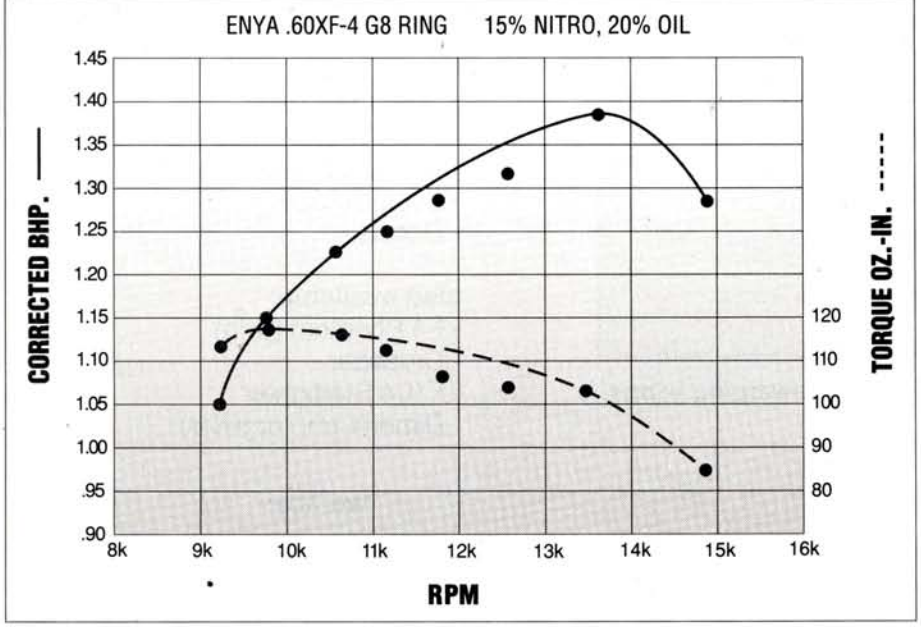
Carburetors were the next big item I noticed. All three of the high-performance units came with either the GM9SC or the GM10GP (you have the option). The GM10GP carb has a "very wide venturi" and, according to Enya, requires a gear pump (GP11) to operate properly. The GM9SC carburetor has a somewhat smaller venturi bore and only requires pipe or muffler pressure...accordingly, it produces less power than the GM10GP. So, you ask, what does our test engine use for a carburetor?

Well, the G-8, as it is known, is Enya's basic unit. This carb consists of a simple rotating barrel whose bore is 8mm (.315 inch). On the surface of the throttle barrel, this type has a machined fuel-metering



The Enya .60 on Sheldon Engineering Co. all-aluminum test stand.

BHP & TORQUE CHART



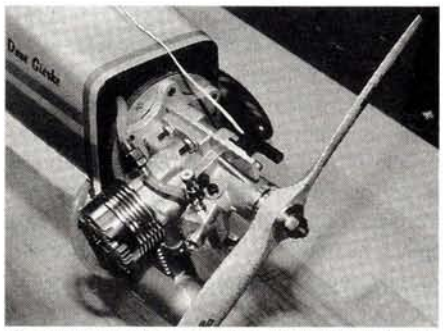
FLIGHT TEST

Engine: Enya 60 XF-4 G8 ring **Airplane:** Airtrax .60
Fuel: 15 percent nitro; 20 percent oil (half castor, half Klotz)

Prop Mfg. & Size	Ground RPM	Air RPM Loop	Air RPM Straight	True Airspeed MPH Loop	True Airspeed MPH Straight	db at 9'	Relative Air Density (%)	Wet Bulb	Dry Bulb	Bar
APC 12-8	10,750	10,500	11,330	55	100		98.8	55	60	29.93
REV-UP 11-8 #4	12,250	12,230	12,690	54	99			55	60	29.93
APC 11-8	12,500	12,130	12,760	53	102			55	60	29.93
GRAUPNER NYLON 11-7	12,500	12,750	14,310	52	93	101		55	60	29.93
APC 11-10	11,200	10,750	11,200	51	101			55	60	29.93
MASTER AIR SCREW 11-7.5	12,580	12,500	13,150	51	98			55	60	29.93
ZINGER 11-7	12,500	12,000	12,560	43	96			55	60	29.93

Throughout test: plug—O.S. RC no. 8; wind—25mph; barometer 29.93; relative air density—98.8; wet/dry bulb—55/60 degrees.

groove that's designed to deliver a slightly rich mixture from idling to medium speed. Because of the relatively small venturi hole, fuel draw is claimed to be reasonably strong for this speed range. Experience running the engine proved this to be true, as no throttling problems surfaced. Idling mixture is accomplished by the oldest of model engine techniques: the venerable air-bleed hole with adjusting screw! I hadn't used one of these jobs since the late '60s, and I wasn't too excited about trying to achieve a reliable idle from one now! But, as you will see later, my greatest fears turned out to be unjustified. Full-throttle mixture control is provided by the adjustment of a standard main-needle valve.



Enya mounted on Airtrax .60 test airplane. Notice the engine's rpm sensor above radial mount.

Other than the rear-exhaust version of these engines (XLF), all other external features are about the same. Cylinder transfer porting is of the popular Schnuerle configuration, with twin ball bearings supporting the crankshaft. The cylinder head, front housing and backplate are held in place by 3.5mm Allen capscrews. Shaft diameter at the thread is .275 inch. Engine weight, including muffler, is 22 ounces.

After disassembly, the ringed piston was observed to be of the standard variety, positioned about .030 inch from the top of the piston. A small pin inserted radially into the piston-ring groove at the ring gap prevents the ring from rotating and "hooking" a port. When re-installing the piston in the liner, care must be taken to ensure that the ring is properly positioned in relation to this pin. The connecting rod is bronze-alloy bushed at the crankpin end, and the cylinder-head design is of the squish-band variety. All in all, the engine is a nice combination of well-made parts with no surprises.

The engine was very clean in-side, but my standard ultrasonic cleaning procedure was performed anyway. No observable contamination (metal chips) was found in the strained (through a piece of silk) cleaning fluid, and the engine was prepared for assembly. By previously marking the rear of the connecting rod (scribe an "x" with an X-Acto knife) of the piston-rod and pin assembly, you don't have to worry about getting it in backward. Although usually not critical, I always mark the front of the cylinder head in a similar manner. Everything else goes together in a predictably correct way!

DYNAMOMETER TEST

Engine: Enya .60XF-4 G8 ring
Fuel: 15 percent nitro (20 percent oil-half castor, half Klotz)

	RPM	TORQUE	BHP	CORR. FACT.	CORR. BHP.	WET BULB	DRY BULB	BAROMETER
1.	14,900	85.6	1.27	1.01	1.28	40°F	42°F	29.22
2.	13,400	103.7	1.38	1.01	1.39	40°F	42°F	29.22
3.	12,600	104.4	1.31	1.01	1.32	40°F	42°F	29.22
4.	11,800	107.6	1.28	1.01	1.29	40°F	42°F	29.22
5.	11,100	112.2	1.24	1.01	1.25	40°F	42°F	29.22
6.	10,600	116.0	1.22	1.01	1.23	40°F	42°F	29.22
7.	9,800	117.5	1.14	1.01	1.15	40°F	42°F	29.22
8.	9,200	113.8	1.04	1.01	1.05	40°F	42°F	29.22

Notes: fuel consumption: 20.3 sec./10cc (1.00 oz./min.) at peak bh.p; 20.4 sec./10cc (.99 oz./min.) at peak torque; idle rpm with flight prop: 2,500rpm.

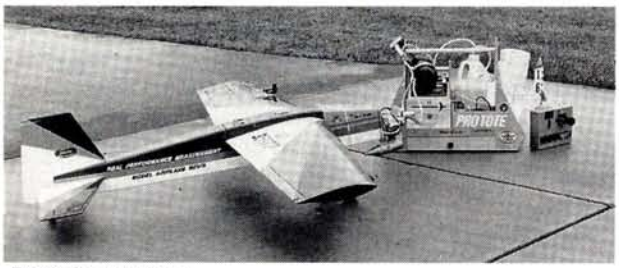
BREAK-IN

While mounting the engine to my super Sheldon Engineering* test stand, I couldn't help but wonder what kind of an animal I had here, with its combination of old and new technology. Enya recommends a variety of fuel blends for their engines, including my long-time favorite: 15 percent nitro, 20 percent oil (half synthetic, half castor oil) and 65 percent methanol. Break-in was performed using an old Top Flite* Super M 10-5 propeller. The engine was run rich (so-called 4-cycling) for 3 minutes and then stopped and allowed to cool for 3 minutes before being re-started. After five runs like this, I found that the cylinder-head bolts were loose and had to be tightened. The engine had to be richened on the next run to maintain the 13,000rpm level we started with.

Airtrax test model ready for flight-testing with Enya .60.

After 30 minutes of this, I increased the rpm level to 13,750, which provided a fast

4-cycle breaking to a 2-cycle operation. The same 3-minute running and subsequent cooling interval was maintained. At about the 45-minute mark, problems surfaced with the support equipment. As I found out later, my Carl Goldberg* power panel had gone bad. Before I figured that out, I burned out one Fox* miracle plug, three Fox RC idle bar plugs and two K&B* 1Ls! You might ask, "What took you so long to figure out something was wrong, dummy?" Strange and interesting that you should ask! The sequence would go something like this: hook up the glow-plug lead, engage the starter on the prop nut, press the starter switch. The engine would turn over, but it wouldn't start. Unscrew the plug, check it and find the element was burned out. Take a new plug, check it on the glow-driver, find it to be OK, install it in the engine, only to have the cycle repeat itself! Finally, I found that when I activated the starter, for some reason, high voltage was being applied through the glow plug! Luckily, I had a back up CG X500 Power Panel. After switching units and charging the discharged 12V gel-cell battery, I was ready to continue break-in. The faulty power panel was replaced by Goldberg, at no charge. They have a lifetime guarantee against failure caused by faulty parts. As Murphy (of Murphy's Law) would have it, however, there wasn't any replacement clause pertaining to destroyed glow plugs.



Ready for sound test.

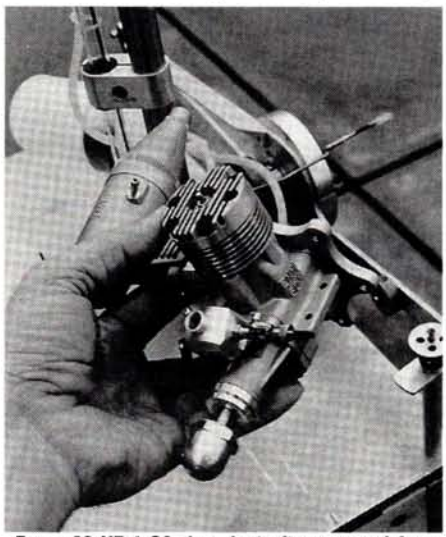
My last series of 3-minute engine runs were performed by needling to a peak rpm, held for 10 to 15 seconds and then richened for a similar period of cooling. The cycle was repeated for the entire 3 minute period. The engine seemed erratic, so I changed from the K&B 1L to an O.S.* no. 8 glow plug. This was a definite improvement, and the engine now held at a steady 15,700rpm at the end of the 63-minute break-in.

My final task involved adjusting the air-bleed carburetor to the factory-suggested 2,500rpm. For this operation, I installed a wooden Rev-Up* 11x8 Pro Series no. 4 propeller. To my surprise, the engine idled beautifully, making a nice transition through the mid-range to full throttle, where it turned 12,200rpm. Could it be that the air-bleed carb has been given a bad rap all these years? We'll see when we get to the "real test"—flight!

DYNAMOMETER TEST: WIDE-OPEN THROTTLE

My various load props allowed me to operate the engine from 9,200 to 14,900rpm. I considered the test very successful because everything worked as advertised. The dyno didn't spew vibration-damper oil all over me, the support equipment all functioned without a glitch and, best of all, the Enya ran really well! It absolutely held a needle setting at all-load rpm without a hint of sagging (losing rpm). I was beginning to really like this "sport and scale" engine. It was proving to be a very user-friendly machine.

As the graph indicates, torque peaks about 10,000rpm, providing a maximum of 117 ounce-inch. Torque holds up admirably until the "critical point"—13,500rpm—at which it drops off more rapidly than the rpm are increasing; here we say break horsepower peaks at 1.4b.hp.



Enya .60 XF-4-G8 ring, just after removal from dyno.

Despite the relatively low power-to-displacement ratio (2.32b.hp/cubic inch), the Enya .60 showed a great tolerance for a variety of propellers. Especially pleasing was the engine's non-critical behavior during needling. Absolutely no adjustments were required to maintain satisfactory throttling. As with the break-in procedure, dyno tests were conducted with the standard 15-percent-nitro blend and the factory-supplied muffler. Atmospheric conditions were good, primarily owing to the cold temperatures experienced throughout the test period. Further, if the engine was operating at peak rpm, a fuel-consumption rate of 1 ounce per minute could be expected through a wide range of operating conditions. A more practical, slightly rich mixture will quickly reduce this efficiency to 1½ to 2 ounces per minute.

Beautifully machined components.

FLIGHT TESTING

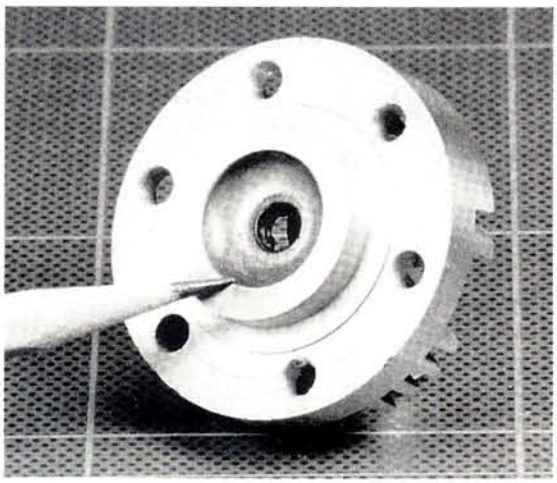
Seven props were tested on the Enya .60/Airtrax* .60 test plane. The model, ready to fly, weighs 7 pounds, which is toward the favorable end of the "suitable craft weight" range suggested by Enya (3 to 5 kilograms; 6 to 10 pounds). This proved to be a fair assessment, as our combination was lively and fun to fly, even in the 25mph+ wind conditions.

I believe that an explanation is in order concerning the method we use in gathering and interpreting flight data. To begin, the model is flown through each course (straight-line speed and loops) a minimum of four times—sometimes five or more cycles, if I make a mistake flying the model. The data are recorded on a chart for later evaluation, i.e., for the APC* 12x8 prop, the rpm through four loops was 10,500 each time. Things don't always work out that nicely; for the same prop, rpm at the straight flights were 11,500, 11,250, 11,300 and 11,250, for an average of 11,325rpm. If a piece of data is found to be "out of the ballpark" it is discarded from the averaging process.

OBSERVATIONS AND CONCLUSIONS

• The APC 12x8 registered a higher air speed through loops than any other prop tested (55mph). It also had the third-highest straight-flight speed (100mph). This turned out to be the surprise of the flight-test session, as both Frank Vassallo (my engineer friend and fellow modeler) and I thought that using it would show a dramatic decrease in airplane performance. Initially, it appeared to be "too much prop" for the Enya. The engine only turned 10,750rpm on the ground, but it handled the relatively heavy load easily (as predicted by the earlier dyno test), without overheating or poor throttle response.

• The APC 11x8 recorded the highest air speed on the straight-flight portion of our tests (102), while operating at 12,760rpm—within 1½ percent of peak b.hp. It also showed the third-highest speed through loops (53mph).



Squish-band cylinder head of modern proportions.

• The Zinger* 11x7 earned a lower air speed through loops than any prop tested (43mph), while operating at 12,000rpm—nearer the torque peak than four other props, but outperformed by all of them from 15 to 20 percent. It was also second lowest for the straight speed (96mph).

• The Graupner* nylon 11x7 showed the lowest air speed on the straight-flight portion of our tests (93mph), while operating at 14,310rpm—almost 1,000rpm beyond the b.hp peak—or, stated another way, "on the back side of the curve." Although operating within 3 percent of the maximum b.hp, the over-speeding condition suggests a mismatch of engine and propeller. Frank and I thought that the Graupner nylon 11x8 would have performed better on this engine/airplane combination.

• The Rev-Up 11x8 Pro Series 4 wooden prop performed better than the other wooden ones. It finished a strong second in air speed through a loop—only 1mph less than the APC 12x8. It also ended up fourth in the straight-line speed, behind the three APC props.

Finally, a confusing observation was made concerning when the greatest load (lowest rpm) occurs for our engine/propeller combination. Six of the seven props tested showed the rpm through loops being less than the ground (static) rpm. Only the Graupner showed an increase.

This is not the first engine/prop flight test in which this phenomenon has been observed. The test of the Webra* .70 also showed several props loading below the ground rpm in loops. This may not seem significant to many of you out there, but for more years than I care to admit to, I—along with everyone else I've talked with during this span—have accepted as "fact" that an engine's greatest load condition occurs when it's stationary (on the ground).

As an example, the APC 12x8 has a ground rpm of 10,750 and 10,500rpm through loops (see Flight Test Chart). Assuming that there isn't a flaw in the telemetering system and the data-retrieval process is valid, why is this happening? Do any or all of the following explanations pertain to this observation?:

• A statically loaded propeller of relatively high pitch produces a stalled blade condition, where load is actually reduced because of cavitation?

• Does gravity affect the load applied to the propeller in a climb, to the point of loading the engine below static rpm?

• The arcing climb of the model produces a loss of momentum, imparted to the engine/propeller combination as an increased load?

• Propeller P-effect. As the model is turning through an arc, its blades theoretically produce a greater pitch on one side of the hub and less on the other. Is the greater pitch adding to the load?

• Gyroscopic precession. Again, as the model is turning through an arc, there exists a force acting at right angles to the axis of rotation of the engine's shaft, and that increases the engine/propeller load.

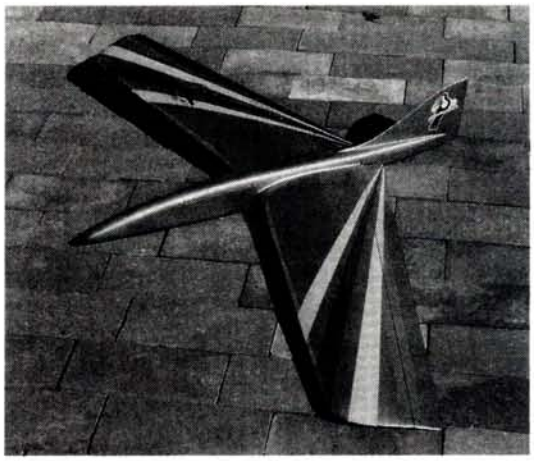
Whatever the reason(s), I have decided to bring this observation to your attention at

(Continued on page 110)

HOW TO

by LARRY RENGER

Brown Baggers Don't Only Do Lunch



This Toucan glider has done very well with simple, paper-bagged wings.

WRAPPING PAPER? On a wing? Where you gonna send it? No, seriously, folks, brown wrapping paper happens to make a really excellent choice for wing covering when you are vacu-bagging foam wing-cores. It works extremely well for small to medium models, and when it's combined with more exotic materials such as fiberglass, it can enhance the strength while reducing the weight and cost of large models. Basically, I like to use brown wrapping paper because it is light, strong, comes in big rolls and is really inexpensive.

A lightweight alternative for skinning foam wings

The material shown in the photo as "60-pound wrapping paper" is available in any stationery store or post office. There's a much lighter material—Kraft paper—that can be useful for some applications, e.g., for stabilizers, rudders and really tiny models. The application techniques are nearly standard for both vacu-bagging and regular brick-and-board sandwich covering.

First, though, a word about wing failure. From what I've seen, wings fail by buckling. In contrast to a true compression failure, buckling is when the material folds in one direction or another (rather than exploding or tearing). Examples: a marble thrown hard onto concrete will suffer a compression failure (blammo!—parts all over). Push a wet noodle, and you'll see buckling failure; nothing really tears, but there is no rigidity. To avoid buckling, you have two alternatives: allow more distance between the surface skins (thicker airfoil), or use stiffer, stronger skins, i.e., you could use stronger skin material, thicker skins of the same weight and strength (to increase resistance to bending), or a "tailored-structure material" such as a glass/paper/glass laminate.

All the prototype Estes Astro Blasters had brown-paper-covered wings that weren't reinforced. This is the number-two model; it had a shorter, smaller canard.

Paper is wood fibers lightly glued together. Reinforce it by impregnating it with epoxy, and you have a material that's as strong as wood. Since the fibers are highly compacted, very little epoxy is required to accomplish this feat. When you put fiberglass cloth over the paper, or—better yet—sandwich the paper between two layers of fiberglass, you have an ideal material: a relatively thick, very light skin with extra-strong surfaces. Of course, glass over balsa has an even better strength-to-weight ratio, but hoo-boy, is that expensive!

Epoxied paper is absolutely the lightest covering for foam; the 60-pound stuff is half the weight of 1/32-inch balsa, and Kraft paper is even lighter. Paper absorbs less epoxy than the open weave of fiberglass does.

The right stuff—60-pound wrapping paper. Nearly 40 square feet of wing covering for less than two bucks.

So, how good is brown-paper covering? The original four prototypes of the Estes Astro Blaster R/C rocket glider were all made of brown paper over white foam. No spars; no fiberglass. Two of the models crashed under power, but the wings survived. The top of one wing was wrinkled, but it was easily repaired (more on this later). The wings have 200 square inches and a 16-percent symmetrical airfoil and weigh about 2.5 ounces per pair.

Since then, two sets of wings for Bob Martin's Talon glider—designed for high-performance slope soaring—have been built with paper covering. The first was a laminate of 0.6-ounce glass cloth over white Kraft paper and weighed 2.8 ounces per pair. The next pair was blue foam with 2-ounce glass cloth over the 60-pound paper and weighed 5.8 ounces. Both sets had a strip of 0.014x½-inch carbon fiber set

vertically under the high point for the inner third of the span.

Other people are flying with paper-covered wings. A set of 100-inch-span glider wings I bagged for George Siposs were interesting because they had a "tailored structure" (all the rage with the high-tech aerospace set). The inner third had 0.6-ounce glass-cloth laminated over and under the paper, the middle third had glass only on the outside, and the outer third was only paper. They weighed just half what his original wing set did.

The sheet of covering was flattened and then creased along the center line, ready for the epoxy.

Paper-bagging also tends to even out minor irregularities of the foam surface. It is not necessary to coat the entire foam surface with filler to achieve a good, smooth finish. Preparation time is greatly reduced. In addition, when epoxied to itself at the trailing edge, the paper forms a razor-thin edge (about 0.006 inch) that is reasonably "ding resistant"—something that can be enhanced with a narrow strip of glass cloth or carbon fabric.

PREPARATION

OK; time to bag a wing. I assume you have a basic understanding of vacu-bagging or "brick-and-board" techniques. Prepare the foam panel by sanding off the "whiskers." Add a 1/16-inch balsa cap to the leading edge, root and tip. These prevent the ends from being crushed by the vacuum, and they enhance the bond at the periphery of the wing. Also, add any internal pieces like spars, servo-opening reinforcements and wing-mounting tubes. To ensure full strength, be sure that the spars touch and are bonded to the inner surface of the covering. Fill *major* dings with a light product such as Goldberg's Model Magic and sand it smooth.

Check the direction of the grain of your paper. Just as when using tissue covering, tear a little piece of paper along and across the roll; the direction in which it tears straight is parallel to the grain. The grain should run parallel to the span of the wing. Cut your covering so it's big enough to fold over the entire panel. Gently pull the paper over the edge of a table to take the curl out of it. Fold the paper sharply in half along the line to match your usual Mylar sandwich fold.

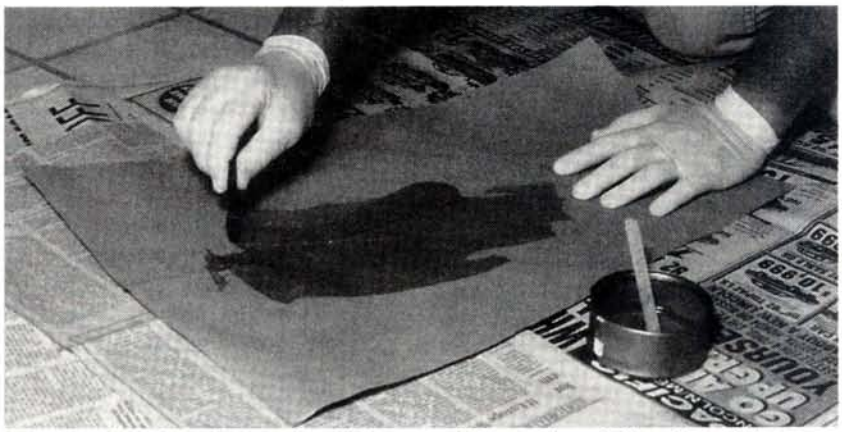
PAPER-BAGGING

Prepare a standard Mylar sandwich sheet with your favorite mixture of releasing agents. On a pad of newspapers, wet the outer surface of the paper with epoxy. (Use a standard laminating epoxy, which will have an "overnight" curing time or longer.) Scrape off as much epoxy as possible before proceeding. Flip the paper over, and put a wet coat on what will be the inner surface of the paper skin.

Let the epoxy soak in for about 5 minutes, then even out the dry spots by applying additional epoxy where needed and squeegeeing as necessary. The paper should be fully "wetted out," but it shouldn't have a thick, glossy coat of epoxy on it. Lay the paper on the Mylar, and squeegee it down in the same way as you'd squeegee glass cloth. I feel more confident if I give the outer 1/2 inch of the foam wing panels and the spar outer surfaces a light coat of epoxy, too.

GLASS AND PAPER LAMINATES

If you combine paper and glass cloth, the routine is similar. Lay down and "wet out" the outer glass cloth on the Mylar as usual. Prepare the paper as already



The epoxy is ready to be spread as thinly as possible over the outside surface of the paper skin.

The paper has been flipped over and is ready for the inner coat of epoxy. You can see where the epoxy has already started to soak into the paper.

described, but this time, the inner coat of epoxy should be squeegeed quite dry. Lay the paper down onto the glass cloth, and squeegee it firmly into contact. Any inner layer of glass cloth is done in the usual lay-up way over the paper. Leave only minimum epoxy on the glass-cloth layers.

FINAL ASSEMBLY

When the epoxy has cured, it is easy to use a band saw for rough trimming. An X-Acto knife and a sanding block are fine for final clean-up. The last step is to add the true leading edge and shape it to the correct contour. Because paper covering is only 0.003 inch thick, you must take precautions while carving and shaping balsa tip blocks and leading or trailing edges. Protect the paper from being cut or gouged by putting a strip of masking tape over the paper, right next to the wood.

FINISHING

Paper covering can be sanded quite smooth in preparation for your favorite finishing technique. For ultimate lightness, just paint the exposed wooden parts with epoxy; the covering is already completely fuel- and weather-resistant. I have used dope, urethane finishes and film coverings on the planes I have made; they have all worked well.

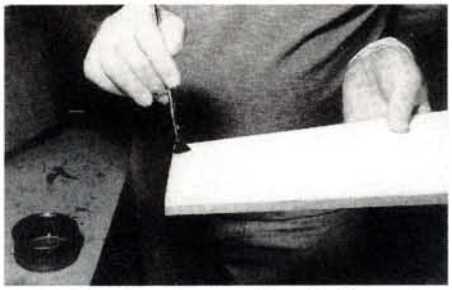
REPAIRS

I was able to repair a "compression wrinkle" in a wing very easily. First, make a row of pinholes along the crease. When you hold the wing, bend it slightly to raise and flatten the wrinkle as much as possible. Put drops of thin CA (one that's safe to use on foam) through every pinhole, and then spray the area with accelerator. This will simultaneously re-stiffen the surface covering and re-bond it to the foam underneath. A patch of light glass cloth or paper can also be laminated over the repair, but this isn't always necessary.

CONCLUSION

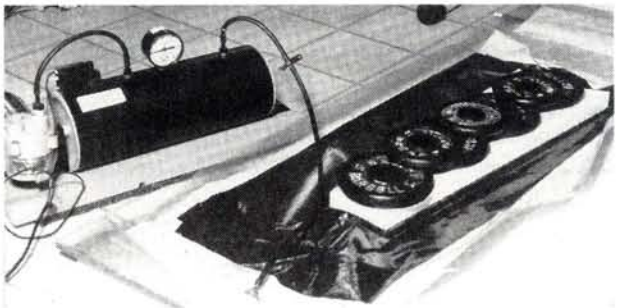
I hope you'll try these techniques. If you do, I'm sure you'll find that paper covering is a valuable addition to your arsenal of building techniques. If you have questions, or you'd just like to let me know how these methods work for you, call me at (310) 404-8034 on weekends or during the evenings before 9:30 p.m. West Coast time. (Like everyone else, I prefer the good news, but I'll be happy to help with problems.). Best of luck, and good flying.

**Here's the address of the company that's pertinent to this article:*
Aerospace Composites Products, *P.O. Box 16621, Irvine, CA 92714.* ■



Just to be safe, put epoxy along the foam edges and the top of the spars.

Just as with the usual bagging technique, the wing-core is folded into a Mylar sandwich that's hinged in the center with masking tape.



The Aerospace Composites* pump system is used here. Be sure your base surface is absolutely flat, or the wing panel will be warped. The weights are there just to ensure flatness; the vacuum is what ensures the best bond.

The brown-bagged wing is ready for trimming, finishing and assembly.

video views

by JEF RASKIN

MADERA '92: THE UNLIMITED AIR RACE

***Subject**: The Unlimited and AT-6 R/C races held at Madera in 1992*

***Source**: AeroStar Productions, 22841 Belquest Dr., Lake Forest, CA 92630; to order, call (310) 320-8369.*

***Summary**: The sights and sounds, the crashes, the crowd, the excitement*

***List Price**: $25.00*

***Length**: 110 minutes*

Here's an exciting visual narrative of the Unlimited R/C races now for the second year in Madera, CA. There's a lot to see in this full-length production: unlimited and T-6 racing, race preparations, the pilots, the judging and the crashes. You get both a ringside seat for the races and an insider's view of the pits. Some of the planes are stunning, with careful workmanship and handsome scale details lovingly lingered over by the sharp-eyed cameras.

It's hard to follow who's on first unless you take notes, but the determination and spirit of the many teams entered comes through loud and clear. This isn't just a single race. Qualifying heats are used to determine the class—bronze, silver, or gold—in which each plane will compete. The pilots then negotiate a thicket of heats and rounds to see who will be in the final trophy race that's flown for each class. This last race settles first, second and third places for each class. While anybody who flies models (or full-size craft) will enjoy the action, the tape could have explained the overall procedure and how this race relates to the full-scale Reno air races—not everybody has a racing background.

For some perverse reason, it's always interesting to watch crashes, and this tape has plenty. The causes vary from running into pylons, diving to get ahead of the opposition and pulling up a few inches below ground level, to a midair or two and numerous failures of systems, engines, or airframes. This reminds us that these planes are pushing the envelope of today's R/C speed technology. If you don't fall off every now and then, you're not really on the edge.

The video has some good shots of the aircraft in the air, especially in the trophy races, which are shown in full—a practice this reviewer wholeheartedly endorses, since you can share the emotional ups and downs as the race proceeds. Other high points include shots of the 150 school children the sponsors brought in to watch the activities, a magnificent Bob Hoover-style one-wheel landing and the flying of full-size AT-6s that came to visit.

Perhaps the hype on the box that claims that "this video will set the standard for all other videos to follow" is a bit overblown, but the video inside is a good, solid report that hasn't been shoe-horned into a few sound and picture bites. I can't imagine a model-airplane buff who won't enjoy it.

KRC 1992

***Subject**: The annual all-electric R/C competition*

***Source**: Astro Flight Inc., 13311 Beach Ave., Marina del Rey, CA 90292; (310) 821-6242.*

***Summary**: Impressive flying and technology; electric-ducted fans*

***List Price**: $10.95*

***Length**: 30 minutes*

A scale Spitfire takes off from the grass, its outward-swinging landing gear retracting into its classic elliptical wing. Climbing strongly, it circles back for some scale aerobatics and makes a low pass for the cameras. A few minutes later, the gear extends and feels for the ground as the dropped flaps slow the slippery shape for a safe landing. The runway is busy as

(Continued on page 123)

ALTECH MARKETING has just released a new, almost-ready-to-cover model of the Pilatus Porter. This is the latest in Altech's series of ARCs, which includes the Zlin Akrobat, the 1/6-scale Stearman, the Haigh Super Star and the Sage 25 and Sage 40 trainers. These models are all of a high quality, and most of the construction has been done for you. You're left with only the major parts to join before covering and finishing.*

The Pilatus Porter PC-6 looks unusual with its distinctive, long, sleek nose that's shaped to fit its turboprop engine. It's a STOL craft (short takeoff and landing), and it's used frequently as a rescue plane in the Alps. On seeing the completed model for the first time, two of my friends said that it looks like an anteater. That name has stuck, so I now refer to it as "The Alpine Anteater."

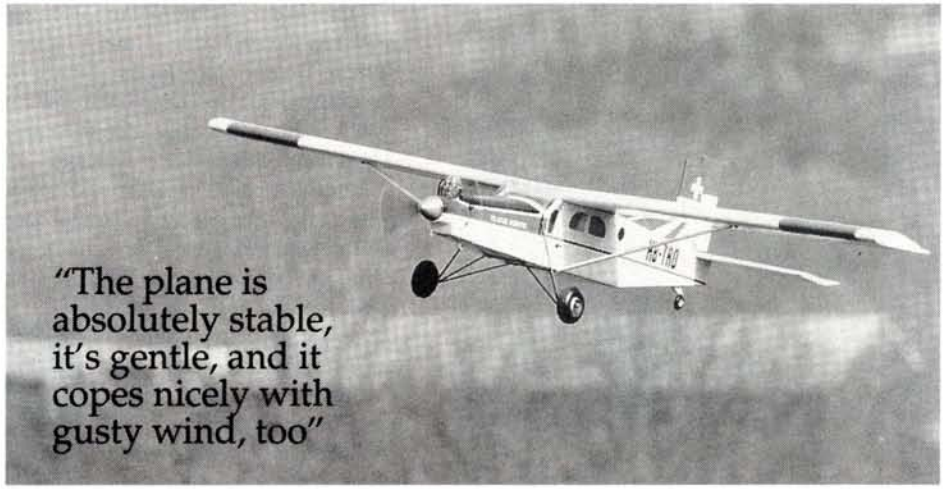
Altech

Pilatus Porter

Docile, different and ready to cover

by DICK PURDY

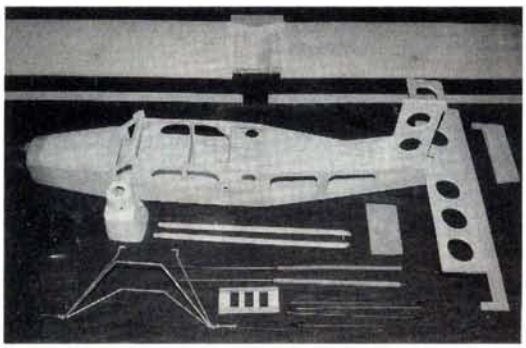
PHOTOS BY WALTER SIDAS

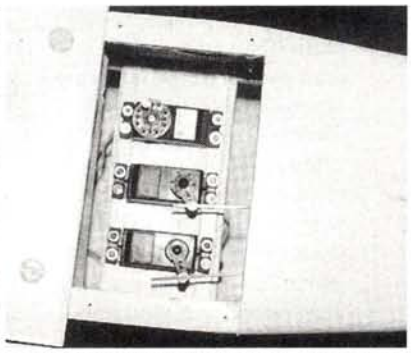


It's a joy to open a kit box and discover an airplane project that's perhaps 85 percent complete and obviously built to that point by very competent craftsmen. The fuselage, wing, tail members and all other components were carefully wrapped to avoid damage. I noticed at once the sturdiness of the various parts, and the care with which they had been filled and sanded prior to being packed into their shipping carton.

The kit package includes hardware, pushrods, formed-plastic windows and windshield, ABS plastic cowl, wire landing gear already welded to shape, hinges, wing struts and other miscellaneous parts needed. The 16-page manual is liberally laced with photos and sketches of assembly details, and there's a separate sheet of instructions on decorating this bird (including plans for cutting out your own decorative markings).

Not included with the kit—but essential for completion—are the following: radio system, engine, fuel tank and tubing, prop, 2¼-inch spinner (a 2-inch spinner is called for in the manual, but that size isn't adequate), 1-inch-diameter tail wheel, a pair of main wheels (I use 3½-inch-diameter for grass fields), wheel collars, glue, covering material and fuelproof paint for the cowl. There are no decals; I think these are really an important missing element. *[Editor's note: Altech points out that if you make your own decals, your plane will look unique.]*





Top left: the Altech Pilatus Porter as it comes out of the box. The surfaces and wing come filled and sanded. Note the pre-bent landing gear. ■ Left: with the parts placed, but not glued, we get an idea of what's to come. With its high aspect ratio and long moments, this model is a fine flier. ■ Above: the servo-access hatch is a neat touch. It makes it easy to make adjustments at the field, and the model's long nose moment makes balancing it easier when heavier engines are used.

I use an Enya* .53 4-stroke engine, but because of the potential hazard of a conventional glow-plug clip and a whirling propeller, I use a remote glow-plug starting harness. *[Editor's note: Altech notes that all Enya 4-strokes come with a remote glow-plug starting harness.]* This Royal Products* device makes it easy to just plug in the glow-starter battery at a safe place on the cowl. I also use a Du-Bro* fuel fitting because it would otherwise be difficult to fill the tank.

In the first steps, the prefabricated fin and stab are epoxied onto the tail of the fuselage. The instructions for installing the tail-wheel wire as a part of this step are lacking; for a flush fit, you should recess the wire gear into the rear of the fin when you install it.

Next, the wing halves are joined by inserting a plywood spar into a pocket in each wing half. Instructions warn you to ensure the spar fits snugly, but the spar plywood was too thin to achieve that. Here, I thickened the spar with an additional 1/16 inch of aircraft plywood, which was then just right for a tight fit.

When the wing halves have been joined with epoxy, a plywood plate is added to the center of the trailing-edge area as reinforcement for the nylon hold-down bolts. Although not called for in the instructions, I used CA to glue 6-inch-wide fiberglass tape to the center joint of the wing halves. (I'm a confirmed belt-and-suspenders man!)

When all the glue had cured completely, it

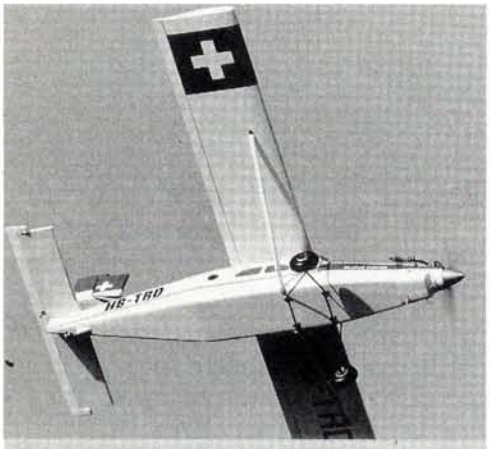
SPECIFICATIONS

Type: Semi-scale sport flier (almost ready to cover)
Wing: 72-inch span; 10-inch chord; flat-bottom airfoil
Length: 52 inches, tail to thrust washer
Wing area: 720 square inches
Wing loading: 27.2 ounces per square foot
Weight: 6 to 8 pounds (review model, 8.5 pounds)
Power: .40 to .60ci 2-stroke; .53 to .80ci 4-stroke suggested; Enya .53ci 4-stroke with Windsor* 11x7 prop used
No. of channels req'd: 4 (aileron, elevator, rudder and throttle)

Features: foam wing, fin and stab come covered with wooden skin; plywood fuselage; all surfaces have been filled and sanded and are ready for covering. A removable panel in the top of the fuselage allows access to the servos (no need to remove the wing). An Asian wood called "falcata" is used extensively; it's very strong, but slightly heavier than balsa. The wire landing gear comes completely soldered and ready to install.

Hits
- Good scale appearance
- Excellent, docile flier; does mild aerobatics with ease
- Very ruggedly built; surfaces filled and sanded
- 16-page instruction manual with lots of pictures

Misses
- No decals included
- 2¼-inch spinner fits better than the 2-inch one specified



FLIGHT PERFORMANCE

- **Takeoff and landing**
With the Enya .53 4-stroke, takeoff runs are long—perhaps as much as 125 feet when there's little or no headwind—and very scale-like. Landings are quite slow, and approaches show that the plane is a "floater." With its wide forward landing gear and long tail moment, taxiing and takeoffs are predictable and straightforward.

- **High-speed performance**
In the air, the plane does not demonstrate high-speed performance as powered. Even if the plane was given more horsepower, forcing it to go faster would be foreign to its mission.

- **Low-speed performance**
Stall characteristics are absolutely remarkable. Its speed can drop seemingly to zero, and this may be followed by a "fallout" that's always straight ahead and level. Slow, stately scale-like flight is obtained at one-third throttle. Even at this slow speed, control response is brisk and positive. This Pilatus is up to the task of training the rank beginner. I recommend a buddy-box training system, because it would be a shame to let a fledgling damage this unique, semi-scale model.

- **Aerobatics**
Though the Pilatus *does* handle easily and is always extremely stable, its performance is very scale-like, considering its modest power. Its aerobatic program includes inside loops, slow rolls, snap rolls, inverted flight, Cuban-8s, and spins. It will only snap-roll if you *force* it to. It has no bad habits, and there are no trim problems with this baby! I really do like this one.

was time to cut a recess for the aileron servo mount in the underside of the wing center section. Here, I opted for two servos (one for each aileron) because I felt flaperons would be fun and useful. With my Futaba* 7 UAF radio, this feature is available.

From this point, until the covering and painting had been done, I followed the manual carefully and without deviation. I use a 12-ounce fuel tank simply because I have room for it. There's a great cavern of space available in the fuselage for servos, Ni-Cds and receiver. My servos are mounted where the plans call for them—in an accessible plywood tray behind the wing trailing edge. The Ni-Cds and receiver are mounted just behind the fuel tank in the front.

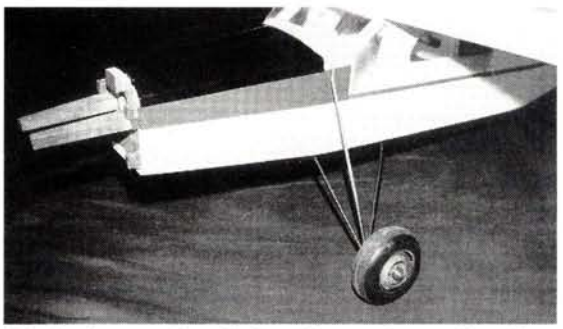
For covering, I chose Coverite's* 21st Century fabric. It's easy to use, and the finish is just great. All the colored panels are of the same material—red fabric—applied over the white base color. The adhesion of the two layers is ideal. The large black letters were cut out of Top Flite trim-sheet material, and the small white letters at the nose are vinyl decals from Vinylwrite*. The ABS plastic cowl is painted with Coverite 21st Century spray paint.

Though not large, the Enya .53 engine does occupy a good bit of the cowl. Two hardwood motor bearers protrude forward from the firewall well into the cowl space. The long, narrow cowl was soon filled with the fuel fitting, its tubing, a remote starter plug and its wires, the throttle linkage, the choke and the needle valve. To put all these into the cowl requires careful planning and execution. I also have fuel tubing for the tank overflow, as well as oil-breather tubing at the front of the engine crankcase that's run out through holes in the bottom of the cowl. That's one very densely packed space!

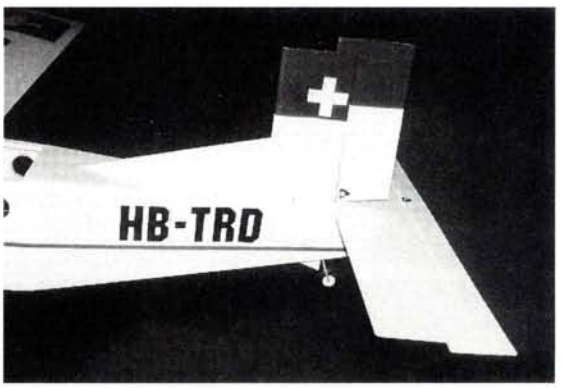
PERFORMANCE

I anticipated the Pilatus Porter's initial flight with some discomfort. I had decided that I wanted the balance point at about 30 percent of the wing chord back from the wing leading edge. The instruction sheet shows the balance to be in front of that, but I let my "gut feeling" govern on this occasion. The model's first flight was an unqualified success. The CG was exactly right where I had put it.

The plane is absolutely stable, it's gentle, and it copes nicely with gusty wind, too. Two friends, Jim Onorato and Al Reinhardt, both flew it during the first flights when I took pictures, and they were kind enough to let me have a turn, too. We were convinced that my "Alpine Anteater" is a pussycat to fly.



The landing gear is well-placed for good ground handling. The scale-like, narrow engine area might be annoying to those who like lots of plumbing, as I do, but with the smallish Enya .53 4-stroke, everything fits.



The shape may be odd, but it's effective and it's scale!

The Pilatus Porter has all the good points of wooden, framed construction, and it's ideal for R/C fliers who have scant time to build. Because you cover it, however, there's a chance to put your own personality into its finish. Although the kit may seem "pricey" at a suggested retail price of $219.98, the finished model is a winner. Its rather unusual appearance ensures that you'll draw attention at the field, and its flight stability is really outstanding.

**Here are the addresses of the companies mentioned in this article:*
Altech Marketing, *P.O. 391, Edison, NJ 08818.*
Enya Model Engines/Altech, *P.O. Box 286, Fords, NJ 08863.*
Royal Products Corp., *790 W. Tennessee Ave., Denver, CO 80223.*
Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*
Coverite, *420 Babylon Rd., Horsham, PA 19044.*
Vinylwrite Custom Models, *16043 Tulsa St., Granada Hills, CA 91344.*
Windsor Propeller Co., *3219 Monier Cir., Rancho Cordova, CA 95742.* ■

PROGRAMMING

(Continued from page 74)

that one aileron servo is not set for more total throw than the other. Also, check for differences in servo installation, e.g., use of different holes in output arms or control horns.

When you are ready to create the differential, determine which aileron servo is channel 1 and which is channel 7. I set up so that channel 1 is always the left aileron (this way it matches the display screen, which always depicts channel 1 to the left of channel 7).

Take the time to experiment with deflection changes. You'll need to push the transmitter stick left or right to read the percentage of right deflection or left deflection in the display. Notice also that you can change the direction of servo travel if necessary. I have found from experience that if channel 1 is backwards, it is best to reverse it in the reversing (REV) function under channel 1 rather than in the DIFF function.

Why? If you don't keep track of what is reversed and where, you may find out that your aileron trim is suddenly moving backwards (in relation to the stick, that is). Avoid this dilemma by always setting up a new plane from a reset radio. Start programming with function REV, and check the direction of each channel you plan to use. You won't know which direction to set channel 7 until you turn on the DIFF function. Having everything else set will speed your programming task.

How much differential. *In my experience, using differential usually requires more upward than downward throw (since a given deflection of downward throw creates greater drag and resultant adverse yaw). When starting, try using 10 percent more upward than downward throw. For example, if you have 30 degrees of downward throw, measure 33 degrees of upward throw (don't go strictly by the percentages shown in the display). You'll have to set your left aileron separately from your right aileron, and you may end up with a completely different formula for right rolls than you do for left.*

Battery extension. *As for the airborne battery extension, I have increased the wire size to 14-16 gauge, taking care to use higher quality wire of the type sold to R/C car enthusiasts in most hobby shops. The extra weight is negligible and usually works in your favor to re-balance the CG.*

I prefer this to using two servo extensions because it keeps the number of connectors to a minimum, which is especially important in the battery circuit. Since bat-

(Continued on page 98)

CLUB OF THE MONTH

THE AJAX RADIO CONTROL MODEL CLUB
c/o Linda Lariviere, 1208 Gloucester Square, Pickering, Ontario, Canada, L1V 3P6.

In the February '93 newsletter, "Tarmac," editor John Brunke offers a professional, entertaining look at the club. In his column, "The Last Word," John uses a new, more readable format. It's something worth holding on to—a handy addition to any flight box. John includes a roster of '93 club officers, meeting information, the location of the flying field and well-formatted editorial and advertising material.

"Paint and Its Application"—a condensed version of Keith Warner's club presentation—offers advice on preparing and painting models. ARCMC's Wings Program '93 illustrates the club's dedication to pilot development and addresses the use of the "buddy cord." The program not only trains new modelers to fly their models, but it also provides "priority flying times" for the students at the flying field, while keeping the rest of the members satisfied. Michael Crichlow provides more technical data in "How to Test a Radio-Control System in Ten Easy Steps." Add to this a "For Sale" section, a crossword puzzle, trivia, photos and a calendar of club events, and the result is a clear picture of a healthy, motivated club.

All too often, the best clubs go unnoticed; so, to give credit where credit is due, we award two one-year subscriptions to the ARCMC for its continued efforts to make our sport fun-filled and safe. Enjoy! ■

PRODUCT NEWS

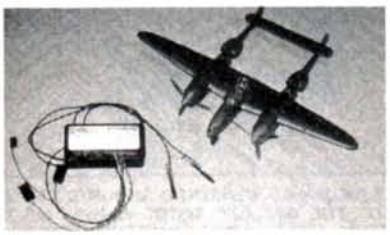
TEJERA MICROSYSTEMS ENGINEERING
The Little Angel

The Little Angel—an audible, on-board receiver-battery monitor—constantly gives you updates on the condition of your Ni-Cd batteries. Three unique beeping sounds signal "Fresh charge," "Midway," or "Don't fly" battery states, and there are no meters or LEDs to hook up! The beeps also remind you to turn off your receiver. The Little Angel can be connected to your switch harness or servo connectors. Small, accurate and light (0.5 ounce), it draws a mere 6mA from your 4-cell battery pack.

Part no. TLA-TL1

Price: $24.95 (plus $3 S&H; Florida residents add 6.5 percent sales tax).

Tejera Microsystems Engineering, Inc., P.O. Box 340608, Tampa, FL 33694; (813) 968-9510.

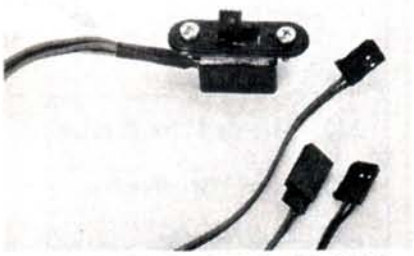


R/C USA
Safety Sync 2000

The Safety Sync 2000 monitors each engine's rpm and tries to keep them in sync. If an rpm differential that's too large for the aircraft to handle develops, the unit enters the "sync-failure" mode and throttles back both engines. To regain normal throttle control, you simply reduce throttle to a preset point, and the system will return control to you. The system features: engine synchronization throughout the throttle range; an adjustable low engine speed in the sync-failure mode; and an adjustable rpm differential. It comes with connectors (specify), magnetic pick-up coils, spinner magnets and instructions.

Price: $179.95

R/C USA, P.O. Box 323, Virginia City, NV 89440; (702) 847-9049.

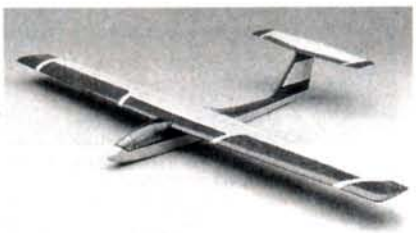


AW MODEL AERO SUPPLY
Big Bird Switch

The Big Bird Switch—a high-quality Noble DPDT (double-pole/double-throw) switch—has 24-gauge, 50-strand wire leads. The unit is 20 inches long (more than long enough to reach the battery and receiver), and the charger connection lead is 11 inches long. The switch-mounting holes are on 1⅛-inch centers, and the internal wiring is secured to withstand vibration. The unit also has a rear cover, and it comes assembled and with your choice of JR Max, Airtronics, or Futaba J gold-plated connectors.

Price: $19.95

AW Model Aero Supply, 111 Honeysuckle Ln. #2, Summerville, SC 29485; (803) 873-5534.



HOBBY SHACK
Super Ridge Runt

The Super Ridge Runt features elevator, aileron and rudder control—all wrapped up in one T-tail package that will fit easily into even the smallest cars! It can perform inverted passes, outside loops, high-speed rolls, hammerheads and sizzling speed runs. You can assemble its foam-core wings in a few hours, and the kit includes: rolled, CAD-drawn plans; die- and machine-cut parts; a basic hardware package; and illustrated instructions.

Part no. 123165

Price: $41.95

Hobby Shack, 18480 Bandilier Cir., Fountain Valley, CA 92728; (800) 854-8471.

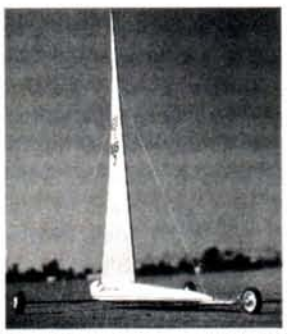
ACE R/C
Bingo 40

Ace R/C's super-popular Bingo tradition continues. This downsized, easy-to-transport version uses a readily available engine, yet it's just as spirited and as easy to build as its two bigger brothers. The kit includes wheel pants and all the necessary hardware. Specifications: wingspan—56.25 inches; area—618 square inches; weight—5.5 to 6 pounds; engine—.25 to .45 2-stroke or .40 to .50 4-stroke; radio—4-channel.

Part no. 50K236

Price: $89.95

Ace R/C, 116 W. 19 St., P.O. Box 472, Higginsville, MO 64037; (816) 584-7121.



MODEL LAND YACHTS
Stiletto

The ¼-scale Stiletto landsailer features: a double, tapered wing mast; a weight-tuned suspension; oversize 11mm-o.d. ball bearings on each of its three wheels; and a variable-rake sail. It comes painted (white), and set-up time is minimal; just charge the radio Ni-Cds and go. It's sold with or without a 2-channel ground-frequency Futaba radio, a 1-S148 servo and a 1-S125 sail servo. (The gear comes installed, and the sail is trimmed to the radio.) Specifications: length—52 inches; height—60 inches; width—34.5 inches; sail area—367.5 square inches; weight—3 pounds, 6 ounces.

Prices: $395 (with radio); $325 (without radio).

Model Land Yachts, Unlimited 10044 Adams Ave. #339, Huntington Beach, CA 92646; (714) 963-6167.

PRODUCT NEWS

DU-BRO PRODUCTS
Feather Lite Wheels

Du-Bro's new, high-quality, shock-absorbing Feather Lite wheels are made of high-tech foam. They're consistently balanced throughout, and this results in smooth take-offs and landings. Their sporty treads will complement your aircraft's appearance.

Part nos. 1.75L; 2.00L; 2.25L; 2.50L.

Du-Bro Products, 480 Bonner Rd., P.O. Box 815, Wauconda, IL 60084; (708) 526-2136.

JR REMOTE CONTROL
JR PCM-10S Computer Radio System

JR's new PCM-10S, top-of-the-line, 10-channel computer radio features: 1024 resolution; dual conversion and ABC&W modulation on all channels (to ensure maximum interference resistance); and sophisticated programming options. This new system is fast, smooth and precise, and its rounded body has soft, comfortable side grips. It's compatible with most JR receivers and available with a choice of servos

Price: $849.95 (transmitter only); $1,199.95 to $1,389.95 (transmitter with servos).

Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61820; (217) 355-0022.

JET HANGAR HOBBIES
F9F-4/5 Panther

This 1/9-scale ducted-fan kit is designed for use with the Turbax I ducted-fan unit and the K&B 9101 (7.5cc) engine. The kit features an epoxy-fiberglass fuselage, a three-piece inlet liner, a fiberglass exhaust liner, pre-seamed epoxy tip tanks, a foam wing and stab, and all the wood required to complete the model. Balsa and plywood parts are pre-cut, and wing skins are included. A clear, full-size canopy, detailed plans and an instruction booklet with photos are also included. A semi-kit that doesn't include wood is also available.

Price: $450 (full kit); $325 (semi-kit).

Jet Hangar Hobbies Inc., 12130G Carson St., Hawaiian Gardens, CA 90716; (310) 429-1244.

CARLSON ENGINE IMPORTS
PAW .49 TBR Diesel Engine

This engine is ideal for aerobatics when it's used with a 12x6, a 12x7 or an 11x8 prop, and it powers a .60-size model. The double ball-bearing engine uses a standard muffler and an R/C carburetor; it weighs 480 grams (17 ounces); and it produces 1.1b.hp at 11,500rpm on an 11x6 prop. Recommended props range from 11x5 to 17x4. The engine has a factory guarantee and post-guarantee factory service.

Price: $150

Carlson Engine Imports, 814 E. Marconi, Phoenix, AZ 85022-3112; (602) 863-1684.

TRU-TURN
Precision Prop Nuts and Hubs

Tru-Turn now offers prop nuts in two shapes and three sizes, ranging from 5/8 to 7/8 inch in diameter. The prop hubs are available in two shapes and in sizes that range from 1 to 2 inches in diameter. This all-new line of hubs is complemented by an extensive line of more than 70 adapter kits.

Tru-Turn Precision Model Products, P.O. Box 836, S. Houston, TX 77587; (713) 943-1867.

DON SMITH
Plans

Don Smith introduces plans for Frank Tiano's Ki-61 Tony. This 86-inch-span model weighs 16 to 18 pounds and is suited to O.S. 108, Webra 120, or Irvine 120 2-stroke engines. Full retract gear and flap installation are shown on the plans. Also new are plans for a 1/6-scale 86-inch-span Grumman F6F Hellcat. Available with either of these plans is "Scaleviews"—detailed full-size drawings that show all the surface details, panels and rivet lines.

Prices: $42 (five sheets, rolled, postage paid); $10 (two sheets of "Scaleviews").

Don Smith R/C Aircraft Plans, 219 Goolsby Blvd., Deerfield Beach, FL 33442; (305) 570-7551.

PROGRAMMING

(Continued from page 94)

teries can be shifted by high-G maneuvers, I have gone so far as to leave out all the connectors between the battery and the switch harness. It's an inexpensive insurance policy. Don't let the antenna run parallel to the battery wiring. Let the antenna exit the fuselage as close as possible to the receiver, and route it to the tip of the rudder or stabilizer to keep this separation to a maximum. DCB

**Here are the addresses of the companies mentioned in this article:*
***JR Propo Remote Control;** distributed by Horizon Hobby Distributors, P.O. Box 3726, Champaign, IL 61826.*
***Futaba Corp. of America,** 4 Studebaker, Irvine, CA 92718.*
***RCD (Radio Control Development),** 94319 Abraham Way, Santee, CA 92071.* ■

BALSA

(Continued from page 71)

In a plantation, however, it is quite different. It would be difficult to get any sizeable quantity of usable wood from a wild balsa tree. Not so in the plantation; every tree is carefully grown so that its trunk remains straight and devoid of branches up to an enormous height. Growing balsa trees requires a considerable amount of work in a difficult environment that's characterized by heat, high humidity and frequent (let's say daily) rain. If you think that the trees grow without needing any special care until they are large enough to be cut and processed, you are entirely wrong. From the tiny leaves emerging from the carefully drained ground, to the tall adult tree, there is a long, work-intensive process.

Because the tropical climate favors the rapid growth of all kinds of trees and weeds, the plantation resembles a dense forest. The soft, damp ground, covered with high weeds and huge fallen leaves, does not allow the use of any machinery. All work has to be done by hand.

Trees are ready to be cut after four to six years, when they've reach a height of approximately 70 feet and a diameter of about two feet. Trunks are sawn into logs of little more than four feet in length; they would not be strong enough to remain in one piece if they were any longer. This is not only because the wood is relatively weak, but also because the fresh wood has a very high water content that considerably increases its weight. Now you understand why it is so difficult to find long balsa sheets.

BALSA IS HERE TO STAY

People tend to think that balsa is expensive—perhaps too expensive. When you compare it

(Continued on page 110)

PROGRAMMING

(Continued from page 94)

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(Continued on page 110)

ROTARY-WING ROUNDUP

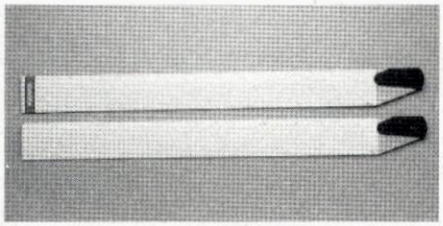
NEW HELI PRODUCTS

HORIZON HOBBY DISTRIBUTORS
Kalt Enforcer ZR

Kalt's new Enforcer ZR .30 helicopter features KSJ main blades, newly designed flybar paddles and a 25-degree pitch travel. It has outstanding forward-flight characteristics and fantastic aerobatic potential. It's also extremely stable owing to its larger rotor disk, longer tail boom, larger tail-rotor drive wire and increased tail-rotor pushrod support. For precise response and durability, the ZR has 36 ball bearings, and metal balls are used at all its linkage points. A main gear made of a new composite, thicker blade grips and a sealed transmission ensure trouble-free operation. Specifications: weight—6 pounds, 2 ounces; length—42.5 inches; rotor span—49.5 inches; radio—5-channel.

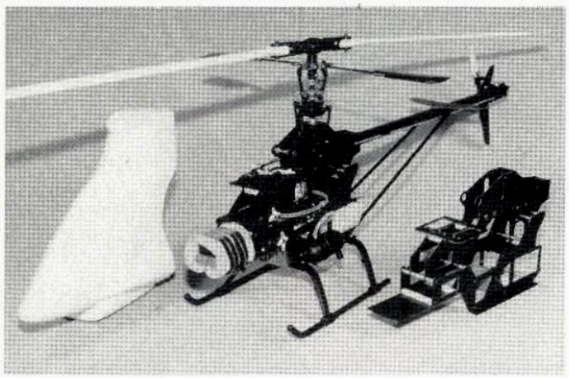
Part no. KLT8500
Price: $479.95
Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-0022.

GREAT PLANES
Kyosho Concept 60 Main Rotor Blades



Instead of a heat-shrink covering, these blades have a thin adhesive-backed covering that sticks to them extremely well and helps to retain their original airfoil shape. They're perfect for all-out aerobatics, because they allow you to increase rotor-head speed without having tracking problems.

Part no. KYOE7335
Price: $66.95
Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-6300.



CENTURY IMPORT & EXPORT
Ninja Pro Side-Frame Conversion Kit

For easy maintenance, the Ninja Pro side-frame conversion kit for Shuttle helicopters features strong, G-10, modular construction. To keep the engine cool, this conversion positions it in front of the main gear, close to the air-intake duct in the streamlined Lexan canopy. To improve the CG, the fuel tank is positioned in a highly visible aft location. For reliability, a dual-ball-bearing-supported tail-rotor drive is installed behind the main gear. The kit includes the canopy, bearings, bearing blocks, a servo tray, a machined standoff and hardware.

Part no. 2001
Price: $149.95
Century Import & Export, 521 Sinclair Frontage Rd, Milpitas, CA 95035; (408) 942-9525; fax (408) 942-9524.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to Gloria Champine of Newport News, VA, for correctly identifying the XB-15—February's mystery plane. There were 175 correct entries submitted.

Gloria really knows this aircraft; she is the stepdaughter of William J. Heldt (Major USAF Ret.), who was one of the crewmen who flew in the XB-15 for all but one flight during its service at Langley Field. Originally designated XBLR-1 (Experimental Bomber, Long Range Model 1), the XB-15 (Boeing Model 294) had a wingspan of 149 feet and a length of 87 feet, 7 inches. It was the biggest bomber built at that time, but it never performed to its full potential because four 850hp twin-row Pratt & Whitney Twin Wasp radials were used instead of the four 1,000hp liquid-cooled engines that were called for in the original design. The XB-15 had a gross weight of 70,706 pounds, a wing area of 2,789 square feet, a range of 5,130 miles and a top speed of 200mph. Small passages in the wings allowed crewmen to crawl to the engines and make minor adjustments during flight. Since the aircraft was designed for research only, it saw no combat, although it was capable of carrying an enormous payload. Used as a cargo carrier (designated XC-105), it was scrapped at Kelly Field, TX, shortly before the end of WW II. ■

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

★ KALT GS ★

ALPHA HELICOPTER

by
MICHAEL R. CINGARI

MANY NEW R/C helicopters have been introduced over the past few years, but very few have been as intriguing as the gas-powered Kalt GS Alpha. This helicopter sets itself apart from all others in many ways. The only field equipment required to operate this machine is a fuel can and squeeze-bulb pump. No Ni-starters, bulky starter systems or field boxes required. Just fuel it up, tug the starter, and fly. With flight times of more than 30 minutes per tank and rock-solid performance, this helicopter is in a class all its own.*

The Kalt GS Alpha helicopter is the third generation of Kalt 2-stroke, gas-powered helis. The original GS Baron was based on the Baron 50 series of pod-and-boom machines. The second generation of these gas-powered machines was the GS Baron II, which had been improved by the addition of a K-5 plastic rotor head and a plastic in-line swashplate and mixer assemblies. The original KG-22 engine was then modified with a solid-state ignition and a new carburetor. These improvements allowed the new KG-22S engine to produce 50 percent more horsepower than its predecessor.

The hardware in the GS Alpha kit comes neatly packed in plastic bags; each bag is numbered for easy identification.

The GS Alpha is equipped with an all-metal Omega tail-rotor transmission, a metal swashplate and mixer assembly. The rotor head that's used on the GS Alpha is the straight pinned axle, "over-slung" flybar, K-5 head. The GS Alpha's KG-22S engine faces rearward and the 380cc fuel tank is in front of the main shaft.

The GS Alpha kit comes with the KG-22S engine, all powerplant-related items, a tool kit and a pull-starter, a muffler, a fan shroud, a fuel filter, a fuel shutoff valve and even a 600cc graduated container in which to mix the gas and oil in the correct ratio. The only items you'll need to get the helicopter flying are a radio system and a gyro.

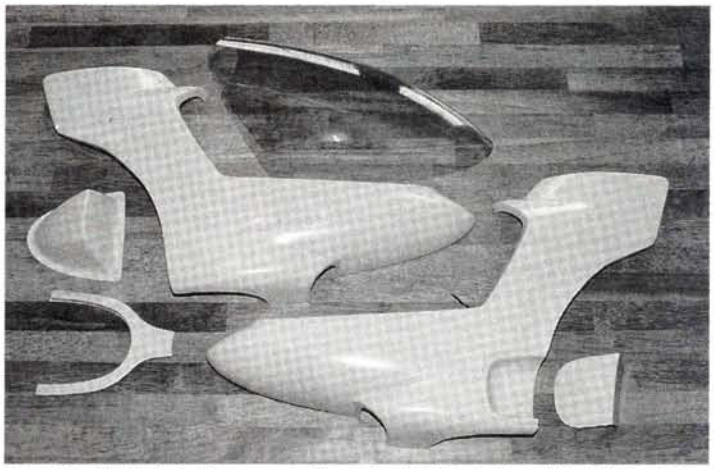
The components of the GS Alpha are very well organized. The assembled rotor head and tail transmission, the swashplate and the flybar paddles are neatly arranged in a Styrofoam container. In another box, the engine is packed with the recoil starter, muffler, the tool kit and various gaskets and hardware. The rest of the parts are packed neatly in the bottom of the box.

ASSEMBLY

The GS Alpha assembly manual is complete and easy to follow. A list of all required tools and a detailed description of hardware selection, identification and use precedes a thorough parts list. A rotor-head manual and an engine manual complete the paperwork.

The assembly of the GS Alpha is divided into nine easy steps. The nine sub-assemblies are packaged individually. The hardware package contains many small, numbered bags that make hardware selection for each step very easy.

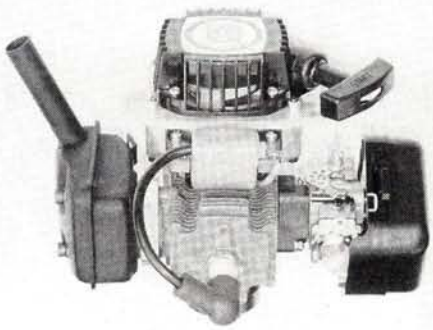
Building the main-frame assembly is the first step. The side frames are finished in satin black and are a massive 2.5mm thick. Two lower angle braces, on which the landing skids are mounted, are attached to the bottom of the side frames. They are replaceable in the event of crash damage, and they strengthen the side frames considerably.



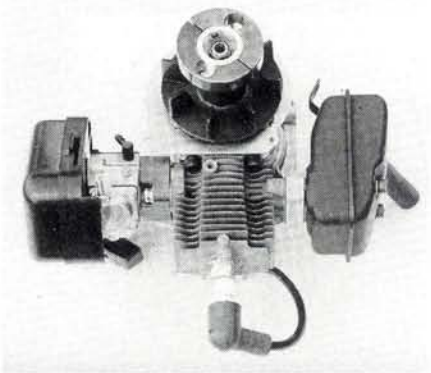
The Alpha's sleek-looking canopy is made of ABS plastic and includes a blue tinted windshield. The parts must be glued together. Glue and decals are included in the kit.

POWER TRAIN

Next, install the clutch bell and associated bearing blocks. The GS Alpha drive train is "free floating," i.e., the clutch bell centers itself on the inside of a bearing located in the taper nut that holds the cooling fan/clutch shoes to the crankshaft. The clutch is unique because both shoes are bolted to the fan hub horizontally. The cooling fan hub self-centers on the engine by use of a tapered crankshaft and a taper nut that eliminates the need to do a runout check. There is no start shaft to align because the engine has a recoil starter. The collective levers, slide ring and roll-bellcrank installation complete this step.



The KG-22S gas engine comes with a pull-starter, a muffler and a carb with a prime bulb and a choke. Because the engine has a pull-starter, there's no starter shaft.



Here you can see the cooling fan and clutch. The cooling shroud has been removed.

In Step 3, the engine, fan clutch and related parts are assembled and installed—pretty much bolt-together pieces. Once I had

SPECIFICATIONS

Name: Kalt GS Alpha
Type: Helicopter
Manufacturer: Horizon Hobby Distributors
Price: $1.299
Empty weight: 12.5 pounds
Overall length: 1500mm
Rotor span: 1460mm
Height: 48mm
Gear ratios: 6.77:1:5.52
Features: kit includes KG-22S 2-stroke gas engine.

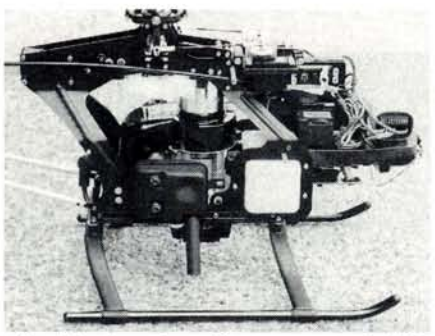
Because the rotor head and the tail-rotor gearbox come completely assembled, the GS Alpha takes little time to build. All parts fit together very well and, overall, it's a high-quality, easy-to-build kit. It isn't inexpensive, but it does come with an engine and many other items that aren't included in other kits. When you consider the low cost of fuel, you'll see the value of the GS Alpha. It's a potent performer that would be excellent for heli pilots who have some experience.

FLIGHT PERFORMANCE

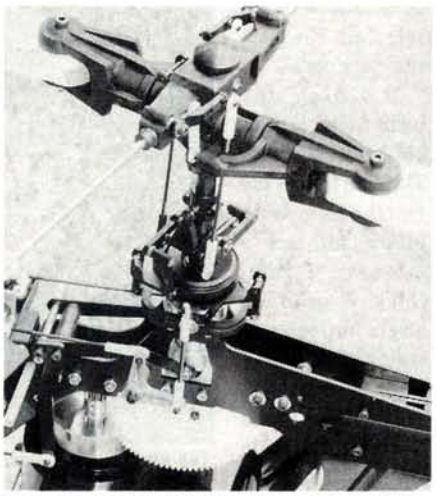
I bolted on the main rotor blades and fueled the chopper. Two pulls later, the engine fired up. After a small adjustment to the tail rotor, the GS Alpha was up in the sky. My first impression was that this is a very smooth, stable machine. It's rather large, so it was also a highly visible aircraft. Twenty minutes later, it still had more than half a tank of fuel left. I was amazed by how little fuel it had used. With this powerplant, the GS Alpha will fly for just pennies a flight. I made a few minor adjustments and refueled the heli.

Hovering performance is excellent and the tail-rotor system is very precise. Climb-outs with the machine are brisk, and forward flight performance is excellent. The GS Alpha is fully acrobatic, and autorotation performance is good with a slight breeze. This helicopter is a few pounds heavier than most other models and requires some planning for aggressive flying and acrobatics, but once you become accustomed to its flight characteristics, it's a blast!

The engine has a distinctive sound that doesn't change during flight. Unlike a glow engine, it doesn't produce any smoke. I feel it performs best with a rotor-head speed of approximatly 1,500rpm. At this speed, the engine's torque provides the power to fly the helicopter. I settled on a hover pitch of +5 degrees to obtain this performance. Top-end pitch for a brisk, steady climb-out with a constant rotor speed was +8 degrees. In the course of the next few flights, the engine began to run more smoothly and produce more power. The reliability of the engine has been excellent. Cold-starting requires the use of the choke, and the engine starts after a few pulls. When the engine is warm, it usually starts on the first pull. I've found that placing one hand on the rotor head and one foot on the skids keeps the Alpha steady during engine starting.



This side view shows the arrangement of the engine, the radio, the gyro and the fuel tank. The sturdy side frames are 2.5mm thick.



The rotor head for the GS Alpha is the plastic K-5 unit; it comes assembled in the kit and it has an "over-slung" flybar.

installed the engine and the carb, I found that the fuel line rubbed against the plastic air-cleaner housing. A quick trim with a razor knife took care of this. I then built the fuel tank and discovered that the supplied clunk had a tendency to slide off the fuel line. I placed a loop of safety wire around the fuel line to secure the clunk. Next, the struts and skids slide together and are held by 3mm setscrews. Be careful not to over-tighten and strip the nylon struts.

The Alpha's tail-rotor transmission and tail-rotor pitch-change assembly are of very high quality.

CONTROL SYSTEM

I then assembled the control section, the main-rotor shaft and the main-rotor drive gear. Care must be taken when you install the pitch-control rod. Make sure it slides freely, and be certain that the scissor arm is aligned with the pitch-control ring. A unique feature of the GS Alpha is its phase-adjusting ring; it allows you to change swashplate timing easily to reduce pitch/roll cross coupling. I found the tail pinion bevel-gear assembly gear mesh to be very tight. To obtain the proper amount of backlash, I had to relieve the bolt slots in the frames slightly.

TAIL SECTION

After you've attached the tail-blade grips and bolted on the nylon tail blades, the tail gearbox is ready to be installed. There's an access plug on the rear of the gearbox. Remove this plug and lubricate the tail bevel gears with a high-quality grease. The completed tail-rotor assembly is the tightest, most slop-free, precise gearbox of any heli that I have ever flown.

Install the three drive-wire supports from the front of the tail boom. Space them equally in the boom. Drill and pin the supports into place to prevent them from moving down the tail boom. I made this modification to my GS Alpha when, after a few hours of operation, I found that my supports had moved to the back of the boom. The horizontal and vertical fins are made of light, hollow plastic. They are flexible and should be resistant to cracks and damage. One item I really liked was the tail-rotor control wire. It was completely assembled and had threaded metal links soldered to each end. Finally, assemble the tail boom and related parts to complete the back end of the GS Alpha.

RADIO SYSTEM INSTALLATION

The two-piece GS Alpha servo tray is prefinished. The cyclic servos are located in the upper section; the rest of the servos are in the lower section. Aluminum servo-clamping plates retain the servos. They ensure that the servos are secure and allow adequate vibration isolation. I installed my JR* PCM 10 radio to control the GS Alpha. I selected JR 4131 servos for the cyclic, a JR 4721 servo for the collective, a JR 471 servo for the tail rotor, and a JR 517 for the throttle. I feel that it's very important to use the correct servo for the control function that it will operate. The GS Alpha weighs significantly more than most helicopters and requires high-power servos to operate correctly. To mount the radio switch, I made a plate from a piece of epoxy board and secured it to one of the cross-members in front of the fuel tank. The switch can be operated by reaching up from the bottom of the canopy. I used a JR 130 gyro to stabilize the tail. The JR 130 is a small, ball-bearing-equipped gyro that gives excellent performance at a reasonable price.

CANOPY

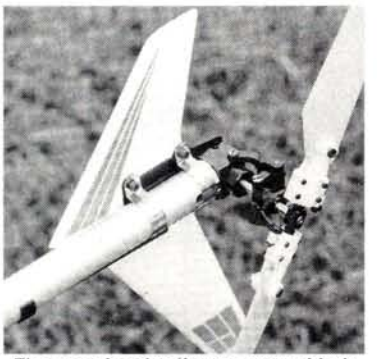
The ABS vacu-formed canopy comes in two main sections and includes a blue-tinted windscreen. It is white and requires no painting. An instrument pod and various reinforcement pieces make up the remainder of the canopy. A small bottle of canopy solvent and a set of decals are also included. The canopy is joined by brushing the solvent onto each flange. I found that using a small tube to allow the solvent to wick into the canopy

flanges after it had been taped together worked well. Use the solvent carefully because it softens and melts the plastic. I trimmed the canopy with a razor knife and finished the edges with fine sandpaper. Trim enough from the lower side flange to allow adequate clearance for the fuel tank.

ROTOR-HEAD SETUP

The K-5 main rotor head comes assembled. All you have to do is install the flybar, the control arm and the paddles and build the links for the flybar and the mixer arms. To allow the nylon links that connect the blade grips to the seesaw arms to thread together, you must remove 4mm from the links; this will produce a rod that's 41mm long. The mixer assembly has two positions for the collective control rods. After I had moved the balls to the outer position, 19 degrees of pitch travel was available.

The flybar is controlled by a single control arm and pushrod. I prefer a symmetrical control system, but for this review, I left the setup stock. There was some slop in the system, but it seemed to operate satisfactorily. That is, until one day during the final stages of flight testing, when the GS Alpha began a left turn and cyclic failure occurred. I had been demonstrating the Alpha's maneuverability when it rolled over and began a freestyle acrobatic show. A few fellow club members commented on the maneuvers as I battled the machine. I knew that the failure was mechanical in nature because I had complete control of the tail rotor, collective and throttle—but no cyclic control at all. The GS Alpha became inverted at about 30 feet, and I knew that the flight would end soon.

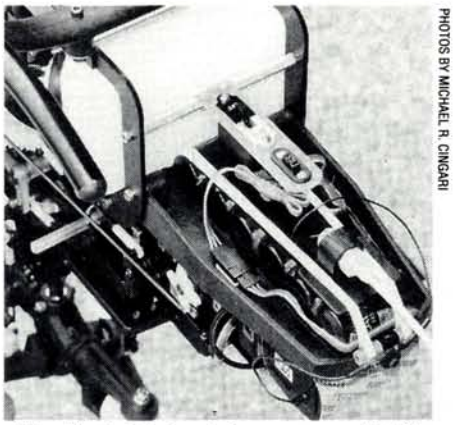


The completed tail-rotor assembly is installed in the tail boom. The unit is of very high quality and offers precise control.

I hit the throttle hold and did an inverted autorotation to a landing. A post-crash investigation revealed the failure of the ball links on the single cyclic pushrod.

Because the GS Alpha weighs more than most helicopters, more feedback force is exerted throughout the control system. This is why the single cyclic control setup is not adequate for a helicopter of this weight. Adding a second control arm and pushrod significantly increases the strength of the cyclic control system. It also reduces flybar slop and creates a symmetrical rotor head.

Future kits should include an additional control arm and pushrod. If you have an early kit, contact Horizon to obtain these parts.



PHOTOS BY MICHAEL R. CINGARI

When the heli is inverted, you can see that the switch harness, charging receptacle, whip antenna and battery fit neatly under the equipment platform.

MAIN BLADES

The main rotor blades are 690mm long and have a semisymmetrical airfoil. They are wooden and covered with white heat-shrink covering material (supplied). The blades weren't up to par with the quality of the rest of the helicopter kit. The trailing edges of the blades were much too thin and weak. I had to use CA to repair and harden them before covering. Although I thought they would cover well, the heat-shrink material distorted the trailing edge. The finished weight of the blades was 170 grams.

ENGINE OPERATION

The engine manual recommends that you use a fuel/oil ratio of 15:1 for initial break-in and running. I use aviation gasoline with synthetic 2-stroke oil. "Avgas" burns cleaner and has much less odor than automobile gasoline. The engine roared to life after a few pulls of the starter rope. I ran the engine on the ground for an hour to get familiar with its operation and to break it in without a load. This also assured me that the radio system would be reliable with the ignition system operating. The engine ran very smoothly, and the radio system was glitch-free. It was time to fly this machine!

**Here is the address of the company that's featured in this article:*
***Kalt**; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821.*
***JR**; distributed by Horizon Hobby Distributors.* ■

BALSA

(Continued from page 98)

with other timber and understand the many delicate, difficult phases of growing and processing, you'll draw the opposite conclusion. Considering its unique properties, balsa is extraordinarily cheap, and it will remain the premium modeling material for a very long time.

Editor's note: Guy Revel is a highly respected French modeling journalist known for his willingness to go to the ends of the earth to get the most interesting stories and the latest modeling news. He also wrote for us in our May '92 issue, when he covered the '91 FAI F3A and F3D competition held in Australia. ■

RPM—ENYA

(Continued from page 79)

this time. There's probably a simple explanation for the questions, and someone out there in our readership has the answer. I hope so; much pondering and discussion have already taken place! Remember, we are breaking new ground here at "RPM." We don't have all the answers. Sometimes, just identifying the questions is a breakthrough!

HITS

• A beautifully manufactured engine! Fun to just look at.

• The Enya handles heavy and light loads (props) with ease. The engine should be great for the big, high-drag scale model that needs large, slow-turning props.

• The small-bore venturi ensured a reliable carburetor that didn't quit once in all our test-flying!

• Excellent and complete instructions, as well as a parts list (complete).

Some other manufacturers should look at what Enya provides with their engines!

MISSES

• Not a very silent muffler (101dB at 9 feet with the model sitting on concrete).

In conclusion, although the .60XF-4 G8 isn't intended as a top-of-the-line, high-output pattern engine, it turned out to be an exceptionally good engine that meets the needs of the sport and scale enthusiast. Personally, I found it great fun to test an

(Continued on page 115)

RPM—ENYA

(Continued from page 110)

engine that wasn't a temperamental beast! Enya's design philosophy clearly produced a winner in that regard!

**Here are the addresses of the companies mentioned in this article:*
Enya Model Engines; *distributed by Altech Marketing, P.O. Box 286 Fords, NJ 08863.*
Sheldon Engineering Co., *295 Jay St., Birchwood, MN 55110.*
Top Flite; *distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.*
Carl Goldberg Models, *4734 W. Chicago Ave., Chicago, IL 60651.*
Fox Mfg. Co., *5305 Towson Ave., Fort Smith, AR 72901.*
K&B Mfg., *2100 College Dr., Lake Havasu City, AZ 86403.*
O.S.; *distributed by Great Planes Model Distributors.*
Rev-Up; *distributed by Progress Mfg., P.O. Box 1306, Manhattan, KS 66502.*
Airtrax; *distributed by L&R Aircraft, Ltd., 13645 Fisher Rd., Burton, OH 44021.*
APC; *distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645.*
Zinger; *distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.*

(Continued on page 123)

RPM—ENYA

(Continued from page 115)

***Graupner,** Hobby Lobby Int'l. Inc., 5614 Franklin Pike Cir., Brentwood, TN 37027.*
***Webra;** distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821.* ■

VIDEO VIEWS

(Continued from page 85)

a twin-engine, ducted-fan flying wing (its engines sounding jet-like at 32,000rpm) and a four-engine B-17 lift off for flawless flights. Just another contest? Nope. All the planes shown flying—and flying well—on this video are electric-powered, for this is Pennsylvania's famous annual KRC electric meet—the aerial Mecca of electromagnetism.

The broad spectrum of models is awesome. This video proves that there is no subject that cannot be duplicated in miniature with electric power. Performance is often astounding; the pylon racers average 145mph on a small closed course—this is in the same speed range as the gas-powered unlimited racers! A cylindrical Gee Bee sweeps by...in knife-edge flight! A scale biplane, flown by Keith Shaw, goes through two scale aerobatic sequences without recharging. As I watched, I noted most of the maneuvers, which included two loops, a hammerhead, two half-Cuban-8s, an avalanche, an outside snap from inverted to inverted, a three-turn spin, a vertical roll, an inside snap, an outside snap from upright to upright, an Immelmann, an 8-point roll and a low inverted pass. Then, it landed and taxied back. If you think electrics are short on air time, this flight alone will convince you otherwise.

Astro Flight has produced a four-barreled video: it documents the 1992 KRC meet, shows the high level of performance of state-of-the-art electrics and provides a convincing argument for the use of electric power in model planes. The fourth barrel is the Gee Bee. See it! ■

AIRWAVES

(Continued from page 8)

Tekoa: The Center of Design, 3219 Canyon Lake Dr., Hollywood, CA 90068; phone/fax: (213) 469-5584.

Dale, my suggestion concerning your O.S. .90 is that you contact Hobby Services: (217) 398-0007. This is a repair-question line only; please don't call them to ask which size of motor is good for a certain airplane. Hobby Services is the division at Hobbico that does all the O.S. repair work. Their address is: Hobby Services, 1610 Interstate Drive, Champaign, IL 61821. Hope this info helped out.

CC

TOSS IT MY WAY

I was very surprised to learn of an event known as the "transmitter toss" that is used as a tie-breaker. In this event, pre-1991 radios are thrown in an attempt to hit a specific spot on the ground, and the closest one wins. I live in a fairly secluded area and do most (so far, *all*) of my flying outside of contests, and I do not participate in any clubs (the nearest one is 150 miles away). Do you know anyone who participates in "transmitter tossing" and might toss one of their old radios my way? I would be willing to put it to very good use. Also, I would be really grateful if you could give me the names and addresses of any clubs whose members might still be in possession of an "obsolete" radio.

MIKE PETTIT
Kirksville, MO

Mike, when I first learned about this event (see "Center on Lift," page 21, November '92), I wondered whether all the number-

(Continued on page 124)

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the ***Model Airplane News*** **Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address and telephone number.

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[7/93]

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[8/93]

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We specialize in R/C jets, both electric and gas planes.Dealer for Violet, Byron and Yellow Aircraft. Mail orders welcome.

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Tel: (604) 255-2838 Fax: (604) 255-7088
[4/94]

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[10/93]

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[5/94]

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251 Danbury Rd., Wilton, CT 06897.

For more information, call toll-free
(800) 243-6685 and ask for Arlene Melko.

AIRWAVES

(Continued from page 123)

crunching and airfoil analysis that many of the sailplane aficionados engage in might not have had a subtle impact on the psyche in certain cases. However, all modelers are entitled to be a little wacky at times. As far as I know, "transmitter toss" is not a widely practiced competition activity, and there are probably tons of these transmitters across the land, just sitting on shelves. Senior editor Chris Chianelli has kindly offered to send you one of his, and I also have an extra that I will send. Whether others will wish to help you may depend on whether you reimburse them for postage, at least! TA

PULLOUT PLAN ADDICT?

Please be advised that my long-suffering spouse has apparently reached her limit and is about to inform the Attorney General of the United States that you are the purveyor of an addictive substance—the pullout plans occasionally published in *Model Airplane News.*

In the past, her objections were not very violent, but the recent issue with the plans for the Extra 3.25, which were more than I could resist over the Thanksgiving holiday, was the straw that broke the camel's back. My presence at the dinner table was very limited and marred by balsa dust falling into the gravy; and all the house remodeling chores that were scheduled for that weekend somehow lost their priority. The only saving grace is that the weather has been too rotten for flying, so I've managed to catch up on some of the chores while still building the Extra 3.25.

Seriously, the pullout plans are a top feature of the magazine, and I hope you will continue their publication.

JOHN HANSON
Kennewick, WA

Thanks for your comments, John. You can expect more such plans in the future. Many of us who share your weakness already know how balsa dust smells, and we note with great interest your exploration of balsa seasoning. Just make sure that no gravy gets on your transmitters! TA

ZURICH TO THE RESCUE

I'm probably the most skeptical son-of-a-gun when it comes to sunglasses. I suffer very badly in strong light, not only by day but at night, too. I think I have tried every brand of sunglasses made, but have never found any relief until now.

AIRWAVES

I've bought both the Zurich mirror-finish gray glasses and the yellow ones, and I probably wouldn't have been that generous with myself had I not heard the comments made by some of the pilots of the full-size Reno racers. They were absolutely ecstatic over these sunglasses. My regular prescription lenses have a very deep curve, and I hadn't found sunglasses that would fit over these lenses. To my surprise, these Zurich glasses fit right over my prescription glasses.

The Zurich glasses provide relief from glare, and the graduated tint is just right so that the darkest part seems to end right at the top edge of the instrument panel in a car or in the cockpit of an aircraft, so I can see the instruments with no problem. With such attributes, you can imagine how well they suit me for R/C flying. A slight tilt of the head allows me to go from dark to very light in my viewing field.

One of the most pleasant surprises was with the yellow-tint glasses. On a hazy day, I took them off and found my visibility quite restricted. I did not really appreciate just how much they improved visibility under these conditions!

I'm not related to Boyd Newman, and my only connection with the company is as a highly satisfied user. I highly recommend these glasses to fellow fliers and R/Cers.

JIM NEWMAN
Hobart, IN

Readers will recognize Jim Newman's name; he's the author of our "Hints and Kinks" column and other works published by Air Age Publishing. At modeling events that last more than one day—where one is exposed to sunlight for many hours—I've found the Zurich glasses to be the best solution for tired eyes. To help spread the word, we join others in the modeling press who have lately sung the praises of these glasses. For more information on them, contact Newman Optics, 5083 Ridgedale Dr., Ogden, UT 84403; (801) 479-7733.

TA

STARSHIP LETTERS

Please forward this letter to the builders of the starship. When I saw the Beechcraft Starship I was impressed by it—to the point of considering trying to build it.

To Dan and Tom: so sorry to hear how some low-down skunk trashed your plane—it sure was a beautiful plane. How may I get a copy of your plans or patterns that you used to build the starship? Also, any advice on construction would be greatly appreciated. If you find those skunks, send them to Texas; we'll take good care of them—if you get our meaning!

JAMES L. TEDFORD
Hondo, TX

James, we have forwarded your letter to Tom Krasin and Dan Scherry. As of the time of this writing, we are unaware of any finished plans that have been prepared for sale by these capable scratch-builders. If any other readers have an interest in building this model, we would be happy to forward your letters to the authors. TA

On page 110 of the Starship article, you mention a spectator who had been on the field before and volunteered the help of a friend who could climb a tree like a monkey. That was clue no. 1: who was this friend? Clue no. 2: phone workers? Their friends? Clue no. 3: the friend of the spectator? No. 4: professional tree trimmer, or his friends? Who did he tell about your model in the tree? Did you learn whether the tree-trimmer ever arrived at the field? Did you

(Continued on page 128)

CLASSIFIEDS

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OLD-TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models.* A true collector's book from the early editors of *Model Airplane News*, it contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $3 S&H for first item; $1.50 for each additional item. *Foreign:* (including Canada and Mexico)—*airmail*, add $7.50 for first item, $4.00 for each additional item. Payment must be in U.S. funds drawn on a U.S. bank, or by international money order. (Connecticut residents add 6% tax; Canadian residents add 7% tax.) Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

VACUUM FORMING—Now in its third printing, the most comprehensive book on vacu-forming ever published for the hobbyist. 128 pages of hands-on information show how easy it really is to make your own plastic parts. Includes exclusive information on an easy-to-build 2-stage vacuum system for truly professional results. It's easy! Try It! $9.95 + $1.05 postage. Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360; (800) 737-3000. $1 surcharge for Visa/MC. [5/93]

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [5/93]

WANTED: your old proportional radios; interested in pre-1980, American made; C&S, Deans, Klinetronics Spar and others. Older is better. Ron Gwara, 21 Circle Dr., Waverly, NY 14892; (607) 565-7486. [9/93]

WANTED: Old, unbuilt, plastic model kits. Planes, military, figures, cars, promo. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192. [9/93]

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pages—timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid, U.S.; $20 foreign. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078. [8/93]

MAGAZINE BACK ISSUES—Flying Aces, MAN, Air Trails, 1930s and '40s. FM, RCM and more. Send SASE for list to: Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [8/93]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667. [10/93]

WANTED: model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649. [6/93]

WANTED: Built or partially built Ercoupes, Mooney M-10 Cadets, or Cessna 150, 152, 172, 182. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585. [10/93]

WANTED: Original kit form, circa 1968-1970, "Schoolmaster" by Top Flight. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [6/93]

WANTED: Original kit form, circa 1960-1963, Eindecker model, free flight or R/C. Barbara Blythe, 484-B Washington St., Suite 341, Monterey, CA 93940; (408) 372-7586. [6/93]

WANTED: model rocket catalogues, magazines, certain rocket kits and engines (1958 to 1975) from Estes, Centuri, Model Missiles, Vashon, Coaster. Art Nestor, 230 Arthur St., Zelienople, PA 16063. [6/93]

THREE THOUSAND-plus old-time plans, rubber gliders, three-views, CL, R/C, boats. Largest illustrated catalogue available—$4. Refundable. Allen Hunt, P.O. Box 726 C, Dunbar, WV 25064-0726. [5/93]

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FROSTING ON THE CAKE! The best "stick-on" graphics anywhere! Spice up your next ho-hum covering job with these eye-catchers! Free catalogue. Silicon Valley R/C Technologies: (800) 822-1500. [6/93]

NONE BETTER in the universe! The best VHS flight-instruction tapes available anywhere! Silicon Valley R/C Technologies: (800) 822-1500. [6/93]

ARF KITS—Ryan-style design; 52" and 72" wingspan. For information, write to Design Consultants, P.O. Box 2189, Culver City, CA 90231. [7/93]

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GEE BEE plans used for Benjamin's R-2 (1/4 scale, etc.). Plans catalogue/news—$3.25 (refundable). Vern Clements, 308 Palo Alto, Caldwell, ID 83605. [5/93]

SCALE AIRCRAFT DOCUMENTATION and RESOURCE GUIDE. World's largest commercial collection. Over 4,000 different color Foto-Paaks and more than 22,000 three-views. Catalogue—$5 ($10 foreign). Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [8/93]

WANTED—World War II and postwar recognition models. Old toy airplanes, cars, trucks, Zepplin, etc. Bill Fornwalt, 103 Dartmouth Ave., Johnstown, PA 15905. [11/93]

INTERNATIONAL AIRCRAFT RESEARCH. Need documentation? Include name of aircraft for availability of documentation with $3 for three-view and photo catalogue. 1447 Helm Ct., Mississauga, Ontario, Canada L5J 3G3. [6/93]

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SCALE DOCUMENTATION: PLAN ENLARGING. 140 super-scale, sport and giant R/C construction plans, three-views, cut-away drawings. Over 100,000 documentation photos in stock; 120-page catalogue—$5 ($10 overseas airmail); Visa/MasterCard. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239). [5/93]

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P/C—THE EASY WAY to simulate metal panels; $1 gets information and sample. Clarke Smiley, 23 Riverbend Rd., Newmarket, NH 03857. [6/93]

UNBUILT PLASTIC MODEL KITS—1/72 and 1/4 scale, from 1950 to present. For list, write to Box 151, Carbon, Alberta, Canada T0M 0L0. [5/93]

1930s to 1950s MODEL AIRPLANE MAGAZINES—1930s aviation pulps—complete and in good condition; $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada, M5M 1W. [6/93]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $2 for large list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [5/93]

FOR SALE—Violett/Jet Hangar A-4 Skyhawk Jet—never flown. New O.S. .65 D.F., Hurricane rotor, Turbax shroud, Rhom-Air retracts and three servos. Beautiful paint scheme; 95-percent complete. $950; buyer pays shipping. Ronnie Stine, 111 Darrell, Heath, TX 75087; (214) 771-5633. [5/93]

LOCKHEED P-38 LIGHTNING—Are you a P-38 Lightning fan?—R/C models or full-size? Join the P-38 Model Organization International! For more information, send $1 to the P-38 Model Organization International, Medelbyvej 54, 2610 Rodovre, Copenhagen, Denmark. [8/93]

ENGINE WRENCHES—precision wrenches for threaded case covers and cylinders. Supercyke, Spitfire, Brown, Bunch. Bob McCord, 325-93 Sylvan Ave., Mountainview, CA 94041. [5/93]

WANTED—Will pay reasonable price for copies of Bill Pinkston's Autogiro plans: Pitcairn PAA-I, Pitcairn PA-18 and Cierva C-19, MK III. Marvin Leazenby, 3105 Moore Rd., Anderson, IN 46011; (317) 643-4092. [5/93]

WANTED—KRAFT KP-4/6 from 1964-66. Karlheinz Schmid, Stieranger 7, 8900 Augsburg 21, Germany. [12/93]

MAKE REAL DECALS with your computer and printer! Send $10 for starter kit and instructions to LABCO, 27563 Dover, Warren, MI 48093-4764. [10/93]

ARE YOU TIRED OF PAYING $1.29 for six screws? For a *free* catalogue and price list of screws, nuts, locknuts, blind nuts and more, in sizes from 0-80 to 1/4 inch, contact Micro Fasterners, 110 Hillcrest Rd., Flemington, NJ 08822; (800) 892-6917; fax (908) 788-2607. [7/93]

O.S. FT-120 GEMINI II flat twin 4-stroke engine N.I.B. $575 plus shipping: (206) 742-7653. [6/93]

SECRET SOURCE—ready-to-fly, electric-powered, jet-like glider with radio installed. Unbelievable performance at crazy low price. Weighs ounces; takes bounces. I bought *three.* Source and details—$3. Charles Rawnsley, 56 Florida St., Lowell, MA 01852. [7/93]

SKYCAM VIDEO—incredible views from a remote-control airplane-mounted video camera; 50 minutes; VHS. $24.95 (includes shipping and handling). Shallow Bank Productions, P.O. Box 369, Ashburn, VA 22011. [7/93]

FOR SALE—airline models; 1:600-scale mounted inside reflective display case. Send $1 for brochure to Aviation Images, 3864 Schiff Dr., Las Vegas, NV 89103. [5/93]

BUILDING BIG BIRDS—Ace, Hots, Lanier, Ohio R/C and Sig kits. Bare bones to completely finished RTF; high-quality workmanship; reasonable rates. Call or write for quotes. Tracey Products, 113 High St., New London, OH 44851; (419) 929-8308 (after 5 p.m.). [5/93]

MISSILE SECRETS—engines, rockets, U-build. $2. Northtech-A5, 813 Cherry Ave., Albany, GA 31710 [5/93]

WANTED—control-line profile kits, Midwest P-63, Skyraider, P-51, ME-109, Sterling Navion, Starfire, Skyshark P-40, ME-109, Ringmaster Sportster, Goldberg Cosmic Wind, Buster, 3-line Bellcranks, Roto-Valve, McCoy 19/35 red/blue, K&B 19/35 green, Dynamic 19/60 throttles, McCoy 19/19RC red/blue, engines. Paul Patterer, 114 Mosher Ave., Battle Creek, MI 49017; (616) 965-5364. [5/93]

AIRWAVES

(Continued from page 125)

look very closely for truck-tire tracks around the tree area? Were there any tracks found? What marks did you find on the trunk of the tree?

What kind of detectives are you two? Flunkies? You can't depend on others to do the investigations, but I certainly hope you learn who the robber was and how he/she got it for the parts.

BOB HANSEN
Muskegon, MI

Tom and Dan comment that they have looked into all of the above. A stripped sapling was used to poke the plane out of the tree. The authorities apparently have an idea who was behind the crime, but no conclusive evidence. The plane was taken 90 to 105 minutes after getting snagged in the tree, and tracks indicated the culprits were running while stripping some of the parts.

TA

EXTRA POWER FOR THE EXTRA?

I feel the direction *Model Airplane News* is taking is right on the money. I enjoy the technical stuff and the pull-out plans for the smaller, scratch-built models. The Extra 3.25 will probably be my first try at scratch-building. Would an O.S. .35FP be too much for this model?

MARK D. SHEEHY
Royal Oak, MI

Mark, we asked its designer, Rich Uravitch, for his comments:

"Modelers who have ordered the plastic parts package from me have also asked this question about engine size. The model has been successfully flown with everything from a K&B .20 Sportster to an O.S. .40FP! The largest displacement engine I have seen in the airplane is an O.S. .32, which provides spectacular vertical performance. If that's what you're after, your O.S. .35 should fill the bill. Remember, however, that all structures have limitations and, although I haven't heard of any 3.25's airframe failing because of over-powering, you're asking it to cope with more power than it was designed for. Accepting that, press on and good luck!

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